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LIVESTOCK PRODUCTION

BY

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LIVESTOCK PRODUCTION

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PREFACE

"Livestock Production" is written especially for use in the beginning course in animal husbandry in agricultural colleges. The author believes that the beginning course should be a survey course that gives the student a concept of the scope of the animal industry, an insight into the opportunities it offers, and a perception of its problems. Besides this, the beginning course should include enough of the fundamentals of successful livestock production to form a foundation on which to build specialized knowledge and skill in succeeding courses. The subject matter of the book will serve equally well students majoring in other fields who will take only one course in animal husbandry.

Following an introductory chapter, citing the importance of animals to man, Section I reviews briefly progress that has been made in the several major fields of livestock production. This review treats of progress in animal breeding, feeding, management and care, marketing, selecting the livestock enterprise, and livestock judging. The production of beef cattle, dairy cattle, swine, sheep, and horses is then treated in separate sections, one for each kind of animal. In the first chapter in each section the products and adaptations of the respective kinds of animals are discussed. The second chapter gives a brief statement of the origin and characteristics of the important pure breeds and breeding methods followed. Chapters on feeding, management and care, and judging of each kind of livestock are presented. Chapters dealing with the market classification and grading of beef cattle, swine, and sheep are included in these respective sections. In the horse section one chapter deals with mule production. The chapters on judging and the market classes and grades are included because a course in which the book is used might well be taught as a combined lecture and practice judging course.

An attempt has been made to follow a logical sequence in the arrangement of the information presented. Should the book be used as a text or reference in a lecture course, the several sections and chapters might well be followed in order. In a combined

lecture and practice judging course, the instructor might begin with any section from II to VI and use the chapter on judging as the first assignment, in order to get the judging practice started, then go to the beginning chapter of that section and follow through in order. The chapters of Section I may then be assigned as additional reading as the course progresses. The author and his associates have found that bringing into the judging ring about two representative animals of each breed of a specific kind at the same time and using them to demonstrate breed differences make an instructive laboratory exercise to go with the chapter on breeding in each section. Likewise, bringing in ten to twelve of each kind of meat animal, with as wide variation as can be secured, then having students classify, grade, estimate weight and price of each, is an instructive exercise to go with each of the chapters on market classes and grades. Other laboratory periods may be used in score-card and comparative-judging practice.

The subject matter of the book is largely general knowledge; hence there are few tables and few reference citations. Sincere appreciation is expressed to coworkers of the animal husbandry staff of the University of Minnesota, who gave encouragement and suggestions of value during the preparation of the manuscript. Special thanks are due my daughter, Mrs. W. E. Remmele, for assistance in preparing the manuscript.

WALTER H. PETERS.

ST. PAUL, MINNESOTA,
May, 1942.

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SECTION I

The Field of Animal Production

CHAPTER I

THE IMPORTANCE OF ANIMALS

The existence of man on the surface of the earth has long been largely dependent upon the animal life existing beside him. At just what stages in his development or at what dates in his history man first began the uses that are made of animals is not known. Fossil remains and contents of caves and tombs indicate that some animals were domesticated thousands of years ago. It is probable that animals were used for food and their skins for clothing long before any were domesticated. It is evident that man became more and more dependent upon animals and animal products with each succeeding step in his advancing civilization.

Important Animal Products.—The major contributions of animal life to the existence and well-being of man may be grouped according to the purpose they serve as (1) food, (2) clothing, (3) power, and (4) recreation.

Animal Life as a Source of Food.—Nearly half of the total food supply of man is contributed by mammalian, avian, and aquatic life. The list of food products of animal origin includes meat from domestic and wild animals, fowl and eggs from domestic and wild birds, milk from cattle, goats, and sheep, and fish of many varieties. All foods of animal origin are highly concentrated, easily digested, health-giving, and highly palatable to most persons. These qualities are due to the high protein and fat content, the low fiber content, and, to a lesser degree, the mineral and vitamin content of such foods. Although the various food products of animal origin are similar in nutritive value, they differ widely in taste. It is because man appreciates variety in the taste of his food that he prefers to eat some of each of the different

kinds of meat and animal products if they are available and he can afford them.

The consumption of food products of animal origin may be limited by their cost or by taste preference. In countries of dense population, the consumption of animal food products is low, and the consumption of cereals and vegetables high, because cost favors the plant foods. In countries of abundant land areas, where animal life may be more economically maintained, the tendency is toward larger consumption of animal products. Within any country taste preference has the larger influence in determining the amount and variety of animal food products consumed in families of high income, whereas cost has the larger influence in families of low income.

TABLE I.—ANNUAL PER CAPITA CONSUMPTION OF FOOD PRODUCTS OF ANIMAL ORIGIN IN THE UNITED STATES, 1939*

Kind of Food	Pounds
Beef	54
Veal	7.4
Pork	57.1
Lard	11.3
Mutton and lamb	6.9
Milk, cream, butter, and cheese (expressed as pounds of milk)	842†
Fowl	30‡
Eggs, in dozens	20‡
Fish	23‡

* Market Statistics Report, *U.S. Bur. Agr. Econ.*, 1939.
† The Dairy Situation, 1940, *U.S. Bur. Agr. Econ.*, *D.S.* 102.
‡ Estimates by trade journals.

The United States is one of the most fortunate of all nations in the abundance and variety of its animal population and availability of animal food products. The development of modern methods of producing, processing, and distributing animal food products has made it possible for every citizen of this country to eat the meat, fowl, or fish of his choice whenever he chooses, provided he can pay for it. Cost is a limiting factor in families of low income, but for the country as a whole the consumption of animal food products is high compared with that of many other countries.

Animal Life as a Source of Clothing.—Leather made from the skins of animals, wool, and furs comprise the principal contribu-

tions of animal life to the clothing supply. Nearly all footwear and gloves are made partly or entirely of leather. A large part of all clothing, blankets, rugs, and upholstering cloth is made of wool and mohair. Furs are used to supplement wool for the warm clothing needed in cold climates. Leather has several additional uses, such as in the manufacture of harness and belting.

Animal Life as a Source of Power.—Horses, cattle, buffalo, reindeer, elephants, camels, goats, and dogs have all been brought under submission as sources of power for various purposes. Preceding the steam engine, electric motor, and gasoline engine, animal life provided man's only source of tractive power other than himself. Except during the last century, animal life contributed all of the supplementary power to man for transportation, construction, and tillage of the soil. Because of their intelligence, docility, speed, endurance, and economic maintenance, horses and mules have eliminated all other animals as a source of power, especially in the more highly civilized countries. In parts of the world camels, elephants, cattle, and dogs are still extensively used as sources of power. The use of horses and mules to supply power reached its maximum in the United States about the year 1915. Since then rapid replacement of horse and mule power by gasoline has caused a marked decline in horse and mule use. In 1940 there were still in use in the United States, principally to provide power for farm operation, about 10,000,000 horses and 4,000,000 mules as contrasted to the maximum number of about 21,000,000 horses and 6,000,000 mules in 1915.[1]

Animal Life in Recreation.—It is not the purpose at this point to enter into a discussion of wild animal or aquatic life. It is, however, these forms that contribute most in the field of recreation through hunting and fishing. They also contribute much in food and clothing material. A statement of the contributions of animal life to man would be incomplete without mention and acknowledgment of the important place occupied by the wild forms.

The domestic animals, notably the horse and dog, are also extensively used in recreation and sport. Preceding the automobile, horseback riding and driving comprised the leading outdoor recreation of people in most countries. Horse racing has

[1] Estimate of Livestock on Farms, U.S. Department of Agriculture, Washington, D.C., 1940.

maintained its position as the king of sports, even in competition with the automobile.

In recent years many men of wealth have chosen to develop stock farms as an avocation, maintaining homes on such farms in order to get their families and themselves outdoors and away from the congestion of the city. Many of these men have developed high-quality herds of purebred animals and contributed much to the improvement of the pure breeds. Many are concerned more with the satisfaction and pleasure they get from the operation of such farms than they are with making a profit from them. Many exhibit animals in the livestock shows principally for the sport of competing with contemporary breeders and the satisfaction of owning winning animals.

Domestication and Distribution of Animal Populations. *Domestication.*—By domestication is meant the confinement and taming of animals by man. Although confinement has made animals many times more useful to man than they could be in the wild state, it has also given man the responsibility of providing care and feed for them. Knowledge concerning the care, feeding, breeding, and management of domesticated animals commonly produced on farms constitutes the field of animal husbandry. All the different kinds of farm animals were maintained under domestication many centuries before constructive efforts to improve their usefulness were begun. It was not until increasing numbers of people and increasing land values made more efficient animal production necessary that systematic efforts toward improvement were made. Efforts toward improvement in animal-husbandry practice, based on scientific knowledge, date back scarcely 200 years.

Distribution.—At what locations on the earth's surface each of the important kinds of domestic animals had their origin is uncertain. It is the generally accepted belief that the horse of today was native to central Asia, northern Europe, and northern Africa; cattle to northern and central Europe and Asia; swine to Asia and central Europe; and sheep to Asia.[1] It is suggested that before domestication, man probably followed the migrations of animals in order to keep near his food supply but that after domestication he took the initiative in migrating and moved his animals with

[1] WINTERS, L. M., "Animal Breeding," p. 14. John Wiley & Sons, Inc., New York, 1939.

him. Since nearly every corner of the earth's surface is now more or less densely populated, the important domestic animals also have world-wide distribution.

The distribution of domestic animals in the Western Hemisphere is of special interest. It is known that there were no animals of present domesticated types on the American continent at the time of Columbus' first landing in 1492, yet today the United States possesses the largest and most varied domestic animal population of all countries. It is generally accepted that both cattle and horses were brought to America by Columbus on his second voyage. When the first hogs and sheep were brought to the continent is not known. The early settlers who founded the colonies during the seventeenth century apparently brought animals of all the important domestic types with them. In the early history of the colonies reference is made to the presence of horses, cattle, sheep, swine, and poultry.

The domestic animals first brought to America were of low efficiency as contrasted to present standards. It was not until the eighteenth century that improved and more efficient groups of animals began to appear in the mother countries of Great Britain, France, Spain, and other western European countries. It was another hundred years, or during the nineteenth century, that improved animals began to be imported from the mother countries to bring about improvement of the stock in America.

The United States is a large country, with vast areas of fertile soil, level or slightly rolling topography, and climatic conditions favorable to plant growth and animal welfare. These natural conditions are favorable to successful and economic production of domestic animals of all kinds. Throughout the history of the country most of its people have been sufficiently prosperous to buy all the animal products they needed or wanted. Most of the time it has been profitable to export some animal products to foreign countries. The natural conditions favoring successful production of domestic animals and economic conditions favoring extensive use of all animal products have combined to produce the great and varied livestock industry of the United States. In its contribution to the basic wealth of the nation and in the annual income derived from it, the livestock industry leads all the great industries of the country.

Animals Contribute to Farm Income.—Although the need of the general public for animal products creates a demand for them, farmers would not engage in livestock production without a profit incentive. This incentive is found in the ability of animals to bring about an increase in the farm income by (1) converting many cultivated crops into animal products of great usefulness and value, (2) grazing of grass and other growth from nontillable areas, (3) converting many otherwise useless by-product feed materials into useful animal products, (4) providing an evenly distributed market for labor, (5) reducing the cost of transportation and marketing of the products of the farm, (6) contributing important items to the food supply of the family at lowest cost, (7) conserving the soil fertility.

TABLE II.—NUMBER OF FARM ANIMALS IN SEVERAL LEADING LIVESTOCK-PRODUCING COUNTRIES AND ESTIMATED WORLD TOTALS

Country	Cattle, 1,000 head	Hogs, 1,000 head	Sheep, 1,000 head
United States*	71,666	52,983	55,880
Canada†	10,083	4,072	3,492
Mexico	8,860	3,698	4,848
Brazil	44,178	23,436	11,876
Argentina	31,540	3,769	40,566
Great Britain	8,459	3,739	26,046
France	15,616	6,606	9,812
Germany	19,134	23,434	3,456
Russia	43,740	15,615	52,960
British India	154,211	250	24,968
China	23,000	84,000	24,000
Australia	12,865	1,121	111,417
World total	697,900	294,700	684,500

For the United States, 1941: horses, 10,364,000; mules, 4,238,000. For other countries figures for horses and mules are not available. United States figures are for 1941. Others average 1931–1935.

* The Livestock Situation, *U.S. Bur. Agr. Econ.*, *L.S.* 20, February, 1941.

† *U.S. Dept. Agr. Livestock Market Statistics*, 1939.

Converting Cultivated Crops into Animal Products.—Many staple cultivated crops such as wheat, rye, oats, barley, and corn have a direct use as human food and also make excellent livestock feeds. Many of these crops are produced in such quantities in the United States that only a small part of the annual production can be used in direct consumption. When fed to livestock and converted

into animal products of greater usefulness and higher value, these surpluses bring a higher price. It is this ability to convert surpluses from salable cultivated crops into products of higher value that provides the greatest opportunity for profit from livestock production on farms in fertile agricultural areas such as the American Corn Belt.

Grazing of Nontillable Land.—In many countries of the world there are vast areas of mountainous land too rough to be cultivated and vast areas of land with insufficient rainfall to grow cultivated crops profitably. Scattered throughout the more fertile areas there are many small patches that are too hilly or too wet to be cultivated. Nature has covered all these with vegetation, largely grasses, that can be grazed by cattle and sheep and thus converted into animal products. The Great Plains region of the United States is such an area. About one-fourth of all the beef cattle and two-thirds of all the sheep produced in the United States are raised in this area. The millions of small patches of land throughout the remainder of the country, suited only to grazing, contribute annually an additional immense amount of food for livestock.

Converting By-product Feeds into Animal Products.—By-product feeds are of two kinds, those produced on the farm itself and those resulting from the processing industry. By-product feeds of the farm include such materials as straw, corn fodder, beet tops, cull potatoes, skim milk, and others. By-product feeds from the processing industry include such materials as the oil meals resulting from the extraction of oil from flaxseed, cotton seed, soybeans, and corn; bran and middlings from the manufacture of flour from wheat and rye; molasses and beet pulp from the sugar industry; tankage, meat scrap, and bone meal from the meat industry; skim milk, buttermilk, and the dried milk products from the dairy industry; and fish meal from fish canneries. All these products have little use or value except as foods for animals, but they do make excellent livestock feeds. By converting them into livestock products, farm animals salvage from them a vast amount of wealth and add to the income of the farms on which the crops are grown as well as the farms on which the by-products are fed.

Providing an Evenly Distributed Market for Labor.—Efficient utilization of his own time and utilization of the time of growing children after they are old enough to contribute productive labor

is a consideration essential to the profitable margin of the small farmer. Efficient year-round utilization of hired labor is an important item in successful management of the larger farms. Most livestock-production enterprises add to the labor requirement of the farm, but they also provide a cash return for the labor, thus making a cash market for more labor of the operator and his family. Most types of livestock production require a larger amount of labor during the winter months. Thus in livestock farming the labor is available for crop production during the growing and harvest seasons while the livestock is taking care of itself on pasture. The labor is then used in the greater and more regular attention required by the livestock through the winter months. This is an especially important item on the farm requiring one or more hired men during the crop season, because a better, more dependable man can be obtained at lower cost if he can be given steady year-round employment. It is a common practice for good hired men to remain in the employ of efficient livestock farmers for a period of years.

Reducing Transportation Costs.—The importance of this saving made by marketing farm crops through livestock is of greatest significance on farms located a long distance from market, because crops converted into animals or animal products are greatly condensed in bulk and weight, and much less transportation space is required in marketing them. In proportion to their value, transportation rates for animals and animal products are lower than for feeds.

Contributing to the Family Food Supply.—This contribution of livestock to the net income from the farm is, of greatest significance to the farmer who is raising a large family and to the larger operator who must board several men. By maintaining the necessary number of milk cows, hogs, and poultry, a plentiful supply of milk, cream, butter, pork, lard, poultry, and eggs may be available at production cost. This materially reduces the amount of food materials to be purchased and makes possible an appreciable saving in the annual food cost.

Conserving Soil Fertility.—Conservation of soil fertility is an important consideration in planning for the continuation of profitable farming. When crops are sold directly, a heavy drain of the fertility of the soil is made each year. When animals or animal products are sold, a large part of the fertility taken from

the soil by the plant growth remains on the farm as manure and can be returned to the land. When animals or animal products are marketed, only that part of the plant growth that is assimilated by the animal is sold. Through preserving the manure and returning it to the land, the fertility of the farm will be reduced more slowly than if the entire crop is sold as plant products. Many farmers buy feed in addition to that produced on their own farms. If sufficient feed is purchased the farmer may return more fertility to the land each year than he takes from it. In this way a run-down farm may be brought back to a high state of fertility through the practice of livestock production.

Questions

1. What important products are secured from animals?
2. List the food products of animal origin.
3. What factors generally limit the consumption of food products of animal origin?
4. What important clothing materials are secured from animals?
5. Discuss the importance of animal life as a source of power.
6. List the contributions of animal life to recreation.
7. Define domestication of animals; animal husbandry.
8. In what parts of the world did each of the several important kinds of farm animals originate?
9. What conditions prevailing in the United States have been favorable to the development of an extensive livestock industry?
10. Give the approximate numbers of cattle, hogs, sheep, horses, and mules in the United States.
11. State the ways in which the maintenance of animals may increase the farm income.

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CHAPTER II

IMPROVEMENT OF ANIMALS THROUGH BREEDING

In the wild state, and for many years after domestication, animals were inferior in body form, low in production, and low in efficient utilization of feed. Livestock producers of today realize that they have not yet attained perfection in production methods. The search for new information that will lead to further improvement in production methods is being continued. Through the centuries, however, knowledge gained in many ways led to marked improvement in animal form, to increased efficiency in feed utilization, and to greater usefulness of animals and their products. Progress in improvement is noted in each of the four major fields of production: (1) breeding, (2) feeding, (3) care and management, and (4) marketing.

An economic need for improvement in quality of products and greater efficiency in production, occasioned by the beginning of the industrial age in western Europe and Great Britain about two hundred years ago, was the incentive for the first extensive efforts to improve farm animals through breeding. By this time animal populations had begun to show some uniformity by groups in different areas. How much of this uniformity was due to natural selection and environment and how much to early selection by man is not known. The observation that some characteristics of certain groups of animals continued to appear from generation to generation led progressive producers to attempt greater control of inheritance in animals by selection for the preservation of desirable characteristics and the elimination of undesirable ones. Because the need for improvement was first felt by producers in the industrial areas of western Europe and Great Britain, it is only natural that the first constructive effort to produce improvement of animals through breeding should have been made in that part of the world.

Robert Bakewell.—Among the men who were striving toward improvement in the usefulness of their animals by selection and

controlled matings during the latter half of the eighteenth century was Robert Bakewell, a farmer in the district of Leicestershire, England. Through his skill in selecting and mating animals, Bakewell produced such marked improvement in his horses, cattle, and sheep in the course of a few generations that neighboring farmers came to his farm to purchase or lease animals from him for use as breeding stock. Bakewell is said to have been a skilled judge of animals, to have selected primarily for utility in form and function, and to have mated the best to the best regardless of relationship. In all probability many animals more or less closely related were mated by him. These principles, plus one other apparently not practiced by Bakewell, that of mating animals from two groups differing in characteristics in an effort to combine the more desirable characters of the two into one new type, are the principles that have been used down to the present time in efforts to secure animal improvement through breeding. Because of his unprecedented success in securing improvement quickly in horses, cattle, and sheep and because of the fact that the methods he used have continued in practice in breeding animals for improvement the world over, Bakewell is considered the founder of the art of animal breeding.

The Pure Breeds.—Although Bakewell did not live to see the recognition of groups of animals as pure breeds, it was the continuation by breeders following closely in his footsteps of the methods of improvement established by him that led to the formation of the breeds. By a breed of livestock is meant a race or group of animals related by descent and similar in most characters. It was through selection toward a common ideal type, usually practiced simultaneously by at least several men in a community, that a considerable number of animals, all possessing some characteristics in common, came to exist in that community. When such groups of animals began uniformly to possess characters of great utility value, they were at once in demand by neighboring farmers for use as breeding stock. Once such a group of animals became established, it was natural that it would in some way be given a group name. Such group names later became the breed names of our present-day pure breeds.

Registration of Purebred Animals.—All present-day pure breeds of farm animals became breeds before the practice of registration, issuing of pedigrees, and publication of herdbooks

was begun. The first venture in the registration of animals, issuing of pedigrees, and publishing of a herdbook was undertaken as a private enterprise by George Coates, of England.[1] Coates gathered together the pedigree information as far back as he could secure reliable data for all the cattle in England then

FIG. 1.—The purebred Shorthorn steer Robin Hood, Reserve Grand Champion steer, International Livestock Exposition, 1940. Produced by good breeding, good feeding, and good care. (*Courtesy of American Shorthorn Breeders' Association.*)

recognized as belonging to the Shorthorn breed. He then published the pedigrees in the first Coates herdbook, in 1822. It was his belief that he could sell copies of this book to breeders and prospective purchasers of Shorthorn cattle and that they would use the information as a guide in selecting breeding animals. The venture proved financially successful for Coates, and breeders did find the pedigrees helpful to them. Subsequently Coates published several additional volumes of his herdbook, listing progeny of animals already recorded and some new

[1] COATES, GEORGE, "The General Short-horned Herd Book," vol. 1, W. Walker Otley, England, 1822.

ones. In a few years it became evident to the breeders that a better plan of handling registration would be for the breeders to form an association and decide upon the animals to be accepted as purebreds themselves. The Shorthorn Cattle Breeders Association of Great Britain and Ireland was formed in 1874.

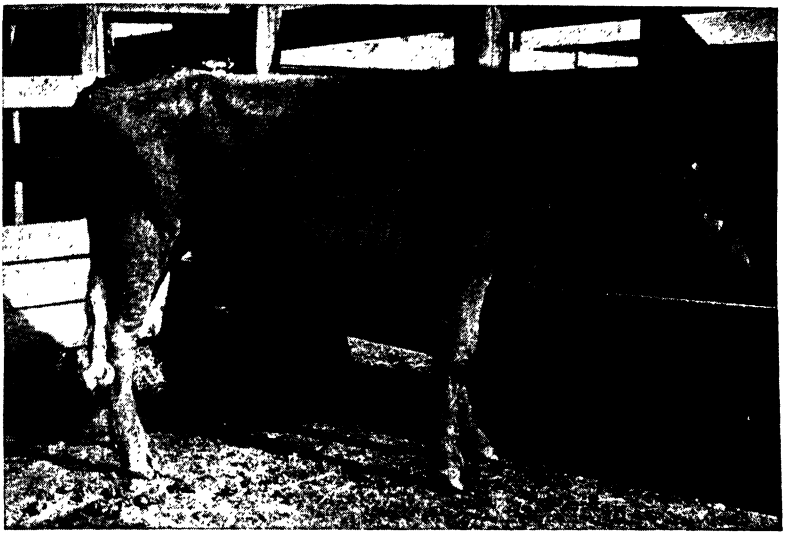

FIG. 2.—A scrub steer. Produced by poor breeding, poor feeding, and poor care. (*Courtesy of Central Cooperative Association, St. Paul, Minn.*)

The records and herdbooks owned privately up to that date were then purchased by the association.[1]

Subsequent to the experience of Coates and the English Shorthorn breeders, the collection of records, issuing of pedigrees, and publication of herdbooks were generally not undertaken for other breeds until after a breeders' association had been formed and the association initiated the collecting of pedigrees. In most breeds the records were kept open for a time and new animals accepted as foundation stock on approval of the members. In time, nearly all record associations have closed their books to new animals so that only animals descended from parents already recorded can be registered.

The motive of breeders in forming record associations has been primarily a selfish one to promote and protect their own interests.

[1] VAUGHAN, H. W., "Breeds of Livestock in America," p. 25, R. G. Adams & Co., Columbus, Ohio, 1931.

Nevertheless, the record associations deserve credit for having successfully maintained the purity of the breeds, promoted improvement within the breeds, and made available to the livestock industry generally the only source of supply of improved sires capable of bringing about quick and marked improvement in the usefulness of the common livestock of the world.

Advanced Registry.—In recent years some record associations, notably those for the breeds of dairy cattle and race horses, have established a supplementary recognition of all animals within the breed that meet certain performance requirements. For example, to be recognized in the Advanced Registry List a mature Holstein cow must produce 480 lb. of butterfat in 365 days. A 305-day record of 415 lb. is also recognized.

Publication of such advanced registry lists, together with the production record made by each animal, has helped breeders to locate the superior animals within their breed and enhanced the value of those animals. Advanced registry has stimulated interest and effort on the part of breeders toward improvement in production capacity and efficiency. Producers of meat animals are attempting to develop satisfactory and practical performance tests, and the future may find advanced registration established by the meat-animal-breed-record associations.

The Livestock Exhibition.—The livestock exhibition is a worldwide institution to be found in every civilized country where livestock is of marked significance to the welfare of the people. There are small community or county fairs and large state, regional, and national exhibitions. In the United States the investment in exhibition grounds and buildings totals many millions of dollars. Millions more are spent each year in conducting the shows and paying premiums.

The exhibiting of an animal to a championship at a livestock show makes that animal no better than if it had not been taken to the show. Livestock shows, nevertheless, have indirectly contributed much toward livestock improvement. They have been the show windows of the industry. Through the competitions breeders have had an opportunity to compare the results of their efforts with those of their contemporaries. In the show ring animal types have been set by the most competent judges. Visitors have had an opportunity to observe the approved types for the various breeds. Prospective buyers have been able to

learn which breeders have the better animals according to show-ring standards and in which blood lines such animals would seem most likely to be produced. All this has had the effect of stimulating enthusiasm among breeders and influencing many persons to buy purebred animals.

Approved Animal Breeding Practices. *Selection.*—Animal breeding is still practiced largely as an art, with greater emphasis placed on selection by observation than on any other procedure. Nearly two hundred years ago Bakewell demonstrated the importance of selection toward a well-defined standard. It was by setting up well-defined types by early breeders, followed by rigid selection of breeding stock toward the ideal, that our present-day pure breeds were formed. Retention as breeding stock of those animals most nearly approaching the ideal type and elimination of those varying widely from it are to a considerable extent responsible for the fixed characters, uniformity, and excellence of the better purebred animals within each of the breeds today.

Most of the improvement that has been made in the common livestock of the world has been accomplished by the mating of purebred sires to common females. Even in this procedure, the females must be culled and a creditable purebred sire used. This requires knowledge of the standard and ability on the part of the breeder to select animals accurately toward the standard, just as does the breeding of purebreds.

Inbreeding.—It is known that Bakewell mated animals that were closely related. Some of his best productions resulted from such matings. It is known also that Bakewell mated related animals only when each was of high merit. Throughout the history of animal breeding, certain breeders have continued the practice of inbreeding or the mating of related animals. In some cases, results have been highly successful; in others, disastrous. Most breeders of recent times have practiced close inbreeding in their herds only after they had used a sire so superior that a successor of equal or superior merit was difficult or impossible to find. In such herds inbreeding has generally proved successful in maintaining the standard of excellence previously attained, because, besides being related, both parents would be of high individual merit. In herds of mediocre merit, inbreeding has generally contributed nothing toward improvement.

The behavior of inheritance in inbreeding is now explained genetically. Geneticists are using experimentally the principles known about behavior of inheritance with markedly successful results. Indications are that carefully controlled inbreeding may be used to greater advantage in securing improvement in the future than it has been in the past.

Crossbreeding.—Some of our present-day pure breeds of livestock had their origin from the crossing of two or more already well-established strains. In theory, the object of crossing two strains to produce one new one was to combine desirable characters possessed by one strain with other desirable characters possessed by the other strain. It was expected that some of the offspring would possess the desirable characters of both parents and that by mating these the desired new type could be established. Success in this endeavor has been limited, but a few new breeds have been produced by this procedure in the past, and several are now in the formative period, such as the Santa Gertrudis cattle and the Columbia sheep.

Crossbreeding has served a second purpose in livestock production. A sire of one pure breed has often been mated to purebred or high-grade females of another breed for the production of market animals. This practice has been most used in market-hog and in market-lamb production. Crossing two breeds generally produces offspring possessing greater vigor, ability to grow more rapidly, and ability to utilize feed somewhat more efficiently. It has been demonstrated that crossbreeding for market-stock production may be continued from the first cross by retaining the crossbred females and mating them to a purebred sire of either of the parent breeds. The use of the crossbred females as mothers results in an additional step-up in vigor. The breeding plan is then continued by alternate use of purebred sires from the two parent breeds. There is some slight advantage in introducing a sire of a third breed, then rotating sires of the three breeds represented.[1] This use of crossbreeding is gaining rapidly in popular favor and practice, particularly in market-hog and market-lamb production.

Grading Up.—Ever since pure breeds of livestock have been available, the standard plan of mating animals in market-stock

[1] WINTERS, L. M., *et al.*, Crossbred Swine, *Minn. Agr. Expt. Sta. Ext. Bul.* 180, 1936.

production has been to mate to common females a sire of the type and breed desired. Continuing to use sires of the same breed from generation to generation in time results in a herd of females possessing most of the characters and qualities of females of the pure breed from which the sires are selected. This practice, commonly called "grading up," is recommended as the most desirable breeding plan for market-stock production, at least until the herd of females has attained a high degree of uniformity. It may then be desirable to introduce crossbreeding to secure an increase in vigor in the young animals.

The Science of Genetics.—It was not until two German scientists, Schleiden and Schwann,[1] in 1838, announced the cell theory as the physical basis of life and inheritance that a scientific approach to the study of animal breeding became possible. Little progress in gaining knowledge leading to scientific control of inheritance was made until Mendelism[2] was explained by Correns, von Tschermak, and De Vries in 1900. It was the knowledge that the cell is the physical basis of inheritance and that all inheritance occurs in an orderly manner according to Mendelian laws that finally made possible a scientific approach to the study of animal breeding. Much knowledge concerning the phenomena that occur and how they occur in the reproduction of both plant and animal life has been accumulated since the year 1900. This knowledge constitutes the science of genetics. That pertaining to plant life is called "plant genetics" and that pertaining to animal life, "animal genetics."

The science of genetics has explained much of why certain results have obtained in animal breeding and has contributed new methods that can be successfully applied in plant breeding, but it is not yet possible to apply genetic principles extensively in animal-breeding practice. Progress of genetic selection in animal breeding has been much slower than in plant breeding, because reproduction in animals is more complex, requires more time between generations, and experimentation with animals is more costly than with plants. It is to be desired, however, that extensive research go forward in the field of animal genetics,

[1] Rice, V. A., "Breeding and Improvement of Farm Animals," p. 14, McGraw-Hill Book Company, Inc., New York, 1926; 3d ed., 1942.

[2] Winters, L. M., "Animal Breeding," p. 92, John Wiley & Sons, Inc., New York, 1939.

because this new science offers to the livestock breeder his greatest hope of learning new and more scientific procedures to assure greater certainty of results and further improvement in animals.

Questions

1. Name the four major fields of animal production in which marked improvement has been made.
2. What was the incentive to the first serious effort to improve animals?
3. In what part of the world was improvement in animals through breeding first noted?
4. Why is the name Robert Bakewell familiar to all students of animal breeding?
5. Define a breed of livestock.
6. How did pure breeds of livestock originate?
7. What is meant by registration of purebred animals?
8. Why is the name Coates associated with the registration of purebred livestock?
9. What is meant by advanced registry of purebred animals?
10. How have livestock exhibitions contributed to livestock improvement?
11. Name the four practices by which improvement in animals through breeding may be secured.
12. Why has the application of genetic principles to animal-breeding practice not kept pace with the application of genetic principles to plant-breeding practice?

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CHAPTER III

PROGRESS IN ANIMAL FEEDING

The feeding of animals is important, because no matter how much merit an animal has inherited from its ancestors, its maximum capacity for growth and production can be attained only if it is properly nourished, comfortable, and healthy.

Feeding as an Art.—In the wild state and under early domestication, animals gained their livelihood by grazing natural plant growth. No doubt, the first aid in securing their food supply given them by man was the cutting of grass during the season of lush growth and storing it as hay to be fed during seasons of drouth and cold weather. As populations increased more animals were needed, and grazing areas became depleted. For centuries man has had continually to introduce new and more efficient feeds and methods of feeding domestic animals. Through the trial-and-error method over many years much was learned concerning the suitability and value of many plants as animal feeds. Much was also learned about preparing feeds, combining them in proper proportions, and the proper amounts to give to secure most economical results.

Many years ago feeding became an art requiring experience and skill on the part of the feeder before a high degree of success could be attained. The old saying, "The eye of the master fattens his cattle," is proof of the high regard in which skill in the art of livestock feeding and care was held by early-day stockmen. Although present-day procedures in the feeding and care of animals are based on scientific knowledge of biochemistry and veterinary medicine, the "eye of the master" is still a highly important factor in successful livestock feeding.

The Science of Biochemistry.—It was not until chemists began to give attention to the chemistry of plant and animal bodies that a scientific approach to the study of animal feeding was made. Chemistry is the science that treats of the composition of substances and the transformations that they undergo. Biochemistry is the chemistry of plant and animal life. An element,

as understood in chemistry, is a substance that cannot be separated into substances different from itself by ordinary chemical means. All matter is made up of about 90 chemical elements, found singly or in various combinations. Of this list only about 28 are found in plant and animal bodies. Plant bodies build their tissues from the soil, air, and water. Animals, in turn, build their tissues largely from plant growth taken in as food. The same chemical elements compose plant and animal tissues, but the compounds or combinations and proportions in which they exist differ materially. It is through the processes of digestion, assimilation, and metabolism that the compounds of nutrition in feeds are broken down from plant tissues and rebuilt into animal bodies and animal products.

All chemical compounds found in the bodies of plants and animals are classified into six groups: water, minerals, proteins, carbohydrates, fats, and vitamins. Water is composed of the two elements, oxygen and hydrogen. The list of important mineral elements includes calcium, phosphorus, sodium, chlorine, iodine, magnesium, iron, sulphur, potassium, silicon, and manganese. They exist in many compounds with other elements in both plant and animal bodies. Proteins contain the elements carbon, hydrogen, oxygen, nitrogen, and sometimes sulphur. Carbohydrates and fats are composed of the elements carbon, hydrogen, and oxygen, the distinguishing difference being a higher proportion of oxygen in the carbohydrates than in the fats. The vitamin group of compounds is a group of complex chemical substances. They are grouped together because they are known to serve purposes in animal nutrition not served by any compounds of known chemical composition in the other groups. They are present in feeds and animal bodies in minute quantities, but the small quantities must be supplied to make possible such processes as growth, normal metabolism, and normal functioning of glands.

The Science Underlying Feeding.—Not only have biochemists contributed a vast amount of information that has explained scientifically the results secured by the artists in feeding practice but they have contributed knowledge that has led to many new and more profitable feeding practices. Knowledge of biochemistry, plus knowledge gained through thousands of practical animal-feeding experiments, has accumulated to the point where livestock

feeding can be planned to a large extent according to the definitely known chemical composition of feedstuffs and the definitely known needs of animals in terms of chemical compounds. Feeding has been placed on a scientific basis through this knowledge. The field of animal feeding is large, and the problems involved are complex. It is not the purpose here to attempt a complete presentation of the many problems involved and practices essential to successful and profitable livestock feeding but rather to point out very briefly progress that has been made in the scientific approach to livestock-feeding problems.

The Chemical Composition of Feeds.—The starting point in an understanding of feeding is a knowledge of the chemical composition of materials that are used as feeds. Practically every kind of plant growth and numerous other products that may serve as food for animals have been subjected to chemical analyses, and their chemical composition is well known. Practically all plant materials contain some water, some mineral constituents, some protein compounds, some carbohydrate, and some fat compounds. The vitamin content has as yet been determined for only a part of the long list of feeds. The vitamins appear not to be so universally present in all feedstuffs as the other compounds of nutrition, but traces of vitamins have been found in a number of feedstuffs, and a few materials high in content of one or more of the vitamins have been located. Feedstuffs differ widely in their percentage composition of the several nutrition-compound groups. Some feeds, such as green grass, silage, and skim milk, are extremely high in water content, ranging from 70 to 90 per cent; others, such as the grains and hay, contain only 10 to 15 per cent water. Feeds differ in the mineral elements and compounds they contain, though the proportion of mineral compounds to the total weight of the feed is generally low, ranging from about 1 per cent to as high occasionally as 7 per cent. There is wide variation in content of the protein group. The protein content may vary from as low as 3 per cent in rye straw to as high as 60 per cent in tankage. The protein content varies widely not only in different plants but in different parts of the same plant. Often the seeds of a plant will be much higher in protein than the foliage, as in the case of oats, where the grain contains around 12 per cent protein and the straw, only 3.5 per cent. Again, the leaves may be much higher in protein than the stems, as in alfalfa. Proteins them-

selves differ widely in chemical composition. Some serve one purpose and some another in nutrition of the animal. Some feeds are high in certain of the protein compounds and low in others. Since animals require certain essential proteins for best results, the value of the protein in a feed depends partly on the kind of protein it is.

Different feedstuffs and different parts of the same plant differ widely in their carbohydrate content, also. Nearly all feeds of plant origin are rather high in carbohydrate content, ranging from a low of about 30 per cent in soybeans to a high of about 75 per cent in corn. Although not so complex in composition as the protein compounds, carbohydrates vary widely in structure and in digestibility. Some are easily digested and are highly usable by the animal; others are tough, difficult to digest, and are of low value. The entire group of carbohydrate compounds is commonly divided into two subgroups designated as "fiber" and "nitrogen-free extract." The tough compounds that are difficult to digest form the fiber subgroup, and those readily soluble and easy to digest go into the nitrogen-free-extract subgroup. The carbohydrates must be identified as fiber or nitrogen-free extract before the extent of their usefulness in a feed material can be judged.

Fats resemble carbohydrates in that they are composed of the same three chemical elements, carbon, hydrogen, and oxygen. The distinguishing difference is that the fats are lower in oxygen than the carbohydrates, so that when they are burned or oxidized in the body of the animal they liberate about 2¼ times as much heat or energy as the carbohydrates. The percentage of fat in feeds varies rather widely but is never particularly large. A range from around 1 per cent in most grasses to 17 per cent in whole soybean seed covers the minimum and maximum limits. The great bulk of feeds range between 2 and 5 per cent fat.

Uses of the Nutrition Compounds.—The second requirement for an understanding of feeding is knowledge of the respective uses the animal makes of the various compounds of nutrition. Much information is available in this field, although it has not been so thoroughly covered or explained as yet as has the subject of the chemical composition of feeds.

Water.—From a minimum of about 30 per cent to a maximum of 70 per cent of the total weight of animal bodies is water.

Animals such as fat hogs or cattle are lowest in water content, and young animals such as young calves are highest. Water has a number of important uses in the animal body. It is essential to digestion, assimilation, and elimination of waste products. In these processes it serves as a solvent and a carrier. Water enters into chemical reactions within the animal body, sometimes providing hydrogen or oxygen when needed to complete a chemical reaction, sometimes resulting from other chemical reactions. Water is helpful in eliminating excess heat from the body, but in cold weather the animal may use energy just to heat the water within its body, especially if a large amount of water is taken into the digestive system at one time. Water is interspersed through all body tissues and serves to give elasticity to the body. All feeds contain some water, but animals always need more water than is taken in with the feeds. Providing regular and frequent opportunity to drink clean, fresh water is one of the essentials of successful feeding.

Minerals.—Animal bodies contain but small amounts of minerals, the common range being from 2 to 5 per cent. Mineral compounds are found in traces throughout all animal tissues, but principally in the bones. The presence of mineral compounds seems to be essential to all life processes. Of the mineral elements, calcium and phosphorus predominate in quantity. Until a few years ago animals were thought to receive sufficient mineral elements except for sodium and chlorine in their ordinary feeds. Recent research has revealed a vast number of facts concerning the needs of animals for minerals and the uses made of them in the animal body. It is known that several of the mineral elements heretofore considered unimportant in nutrition are of great importance, even though needed in very minute quantities. Iodine and iron are examples of such minerals. It is also known that ordinary rations may be and often are lacking in sufficient minerals to supply the needs of the animal and that additional minerals must be provided by adding mineral rich supplements to the feed. Further study of the uses of minerals in animal nutrition, the adequacy of minerals in rations, and how best to avoid mineral deficiencies needs to be made.

Protein.—The protein content of animal bodies ranges from about 10 per cent in very fat mature animals to 20 per cent in thin young animals. Most of the protein in the animal body is

found in the muscle tissue. The protein group is the only group of nutrition compounds containing nitrogen. In addition to the need for protein for the building and repair of body tissues, the protein compounds are essential to the life processes. Because of their complex chemical composition, their universal need in all animal feeding, and the fact that animals are so often handicapped by an insufficient supply of protein in the ration, the proteins have long been recognized as the most important compounds in animal feeding. The protein requirements of animals have been thoroughly determined, and the practical feeder needs only to obtain available information in order to provide the most economical protein needs of his animals.

Carbohydrates.—The principal uses of the carbohydrate compounds are to provide heat and energy to the animal and to form fat. Carbohydrate compounds as such are found in small amounts in animal bodies. They are either oxidized to provide heat or energy or transformed into fat soon after being taken in as feed. The high carbohydrate content of most feeds simplifies the securing of a sufficient supply of carbohydrates in rations. It must be remembered, however, in judging of the value of carbohydrates, that their usefulness to an animal depends on whether a large part of the carbohydrate content is in the form of fiber or nitrogen-free extract. Mature beef cattle, sheep, and horses being maintained as breeding stock can secure enough digestible carbohydrate material from rations that are composed largely of roughage and that are high in fiber, but hogs, fattening cattle and lambs, work horses, and high-producing milk cows must have rations in which a large part of the carbohydrate content is in the form of nitrogen-free extract. This means supplying a part of the feed to such animals in the form of grain and concentrates, since these feeds are high in nitrogen-free extract and low in fiber.

Fats.—Fats in feeds are used for the same purposes as carbohydrates to produce heat and energy and to form animal fat. The percentage of fat found in the animal body varies widely. Young, thin animals will be lowest in fat content, and mature, fat animals will be highest. The range is from about 5 per cent of the total body weight in young, thin animals to about 35 per cent in very fat animals. Most feeds, even the concentrates, contain only from 2 to 5 per cent fat. Although rapid formation

of fat in the body is the object of much livestock feeding, the fat content of feeds is not of great consequence, because its purpose of supplying heat and energy and building fat may be performed by the carbohydrates. It is usually cheaper to provide feeds high in carbohydrates than to provide feeds high in fat content. The fat in feeds does, however, have a nutritive value 2¼ times that of carbohydrates, and a moderate fat content of 3 to 4 per cent in a feed steps up its feeding value appreciably. A very high fat content in a feed is objectionable, because the digestive system of the animal cannot handle it, and animals may easily be thrown off feed or made sick by feeds containing 10 per cent or more of fat.

Vitamins.—Knowledge of the existence of the group of substances called "vitamins" and the purposes they serve in nutrition is the most recent major contribution of the science of biochemistry. For lack of knowledge of the chemical composition of the vitamins, when first discovered, they were identified by assigning a letter of the alphabet to each one known to serve a definite purpose. The letters used were A, B, C, D, E, and G. In most cases the first value found for each one was that it served to prevent some nutritional disease, such as the prevention of xerophthalmia by vitamin A, prevention of beriberi by vitamin B, prevention of scurvy by vitamin C, and the prevention of rickets by vitamin D. For a time the vitamins were then known by the deficiency diseases they prevented. For example, B was called the "antineuritic" vitamin; C, the "antiscorbutic"; and D, the "antirachitic."

It is now known that several of the vitamins serve more than one purpose. For instance, vitamin B has been found to be a group of several substances, each serving a different purpose, rather than a single substance, as it was at first thought to be. The chemical composition of the substances from which the vitamins are made in the animal body is now known for most vitamins. The chemical composition of the vitamin itself is known for some of them. The vitamins have recently been given names based on their chemical composition or the composition of the substances from which they are made. In time they will probably be known by names rather than by the letters.

The content, or at least the presence or absence of a trace of each vitamin, has been determined for a number of feeds. Many

feeds contain at least a trace of several vitamins. Green feeds are fairly well supplied with all of them except vitamin D. Since animals synthesize vitamin D when exposed to sunlight and green feeds are usually fed by pasturing, it is seldom that an animal on good pasture requires any vitamin supplement. Most rations composed of a good quality of roughage and some grain will contain enough of all vitamins to supply the needs of all animals. Swine, dairy-cow, and poultry rations must have a liberal supply of certain of the vitamins. Since rations for these animals are ordinarily composed largely of grains and most of the grains are low in some of the vitamins, it is often necessary that supplemental feeds rich in certain of the vitamins be included in those rations if best results are to be secured.

Digestion, Assimilation, and Metabolism.—The conversion of feed into body growth, the maintenance of the activities necessary to sustain life, and the production of work or milk are complex processes involving the digestion of the feed, the absorption and distribution of the digested food nutrients into the body tissues through the circulation of blood and lymph, the metabolic processes of building up and breaking down of body tissue, and the elimination of waste products. Many digestion trials have been made as well as many determinations of the energy value of different feeds. Studies of these processes are carried on in properly equipped laboratories by men trained to do such experimenting and are not a part of the everyday task of livestock feeding. Results secured are interpreted by the workers in this field, and procedures that may be followed to advantage in feeding practice are thus determined and the information distributed in many ways so that the practical feeder need only follow instructions in order to benefit from the information.

It has been the purpose here not to enter into a complete discussion of the field of nutrition but to point out the breadth of this field and indicate that there is a background of much scientific information on which practices recommended in feeding as set forth in later chapters in this book are based.

Questions

1. What is the interpretation of the maxim, "The eye of the master fattens his cattle"?

2. Define chemistry; biochemistry; a chemical element; a chemical compound.

3. Name the chemical elements most commonly found in plant and animal bodies.

4. Name the six groups into which the chemical compounds found in plant and animal bodies are classified.

5. State the chemical characteristics distinguishing each of the preceding groups.

6. State the important uses of each of the chemical compound groups in animal nutrition.

7. Distinguish among the following nutrition processes: digestion, assimilation, metabolism.

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CHAPTER IV

THE CARE AND HEALTH OF ANIMALS

The care of animals implies the doing of those tasks essential to their daily comfort and welfare. Management implies the planning of livestock enterprises and the procedures essential to their successful completion. Specifically, management involves such items as supplying capital, providing land, selecting the livestock enterprise, providing housing, fencing, water supply, and feeds, and the purchase and sale of animals. Care involves such daily tasks as preparing and placing feed before the animals, keeping water available to them, cleaning buildings, providing bedding, grooming, milking, giving attention to mother and offspring at time of birth, looking after the mating, keeping the necessary records, and doing the hundred and one other things required in the successful maintenance of animals. Above all else, under care falls the responsibility for maintaining health, taking the necessary precautions to prevent the development of disease infections and parasite infestations, and administering to the ills and injuries that occur in spite of all efforts to prevent them.

Importance of Care.—Several factors account for an ever-increasing importance of animal care: (1) the need to produce better animals to meet the ever-increasing competition at the markets; (2) the need for more efficient feeding to reduce production costs; (3) the need for the maintenance of better health to avoid loss from parasites, disease, and death. Progress in breeding and feeding has made possible the production of more thickly fleshed meat animals, heavier milking cows, and young animals that grow more rapidly and mature at earlier ages. To accomplish these ends, animals have had to be produced under more artificial conditions and under greater strain on their systems. These conditions are bound to make them more susceptible to many ills.

A successful animal caretaker need not know the fundamental facts of genetics, biochemistry, and veterinary medicine, but he

must be ready and willing to carry out instructions given by those who do. The successful animal caretaker must have sufficient interest in his charges to be willing to spend long hours with them. He must often change previously made plans on short notice and frequently be up at night to look after a mother and offspring at parturition time or to administer to a sick animal. As a reward, he generally has the satisfaction of a profitable enterprise, whereas the careless, indifferent caretaker is more likely to have the disappointment of a financial failure. Just as in breeding and feeding, many new practices in care have been learned. Upon the caretaker's knowledge and application of these practices often hinges the difference between financial success or failure of the entire enterprise.

The Animal Health Problem.—It has been suggested that there are more animal diseases and parasites than there were in earlier times. It is doubtful if this is true. It must be remembered that there were no domestic animals on the Western Hemisphere when Columbus discovered it. Therefore, there should have been no domestic-animal disease germs or parasites. There were wild animals of many forms, and some of our present-day domestic-animal ills may have been present in the wild animals and may have been transmitted by them to the domestic animals. Foundation animals for all our domestic-animal populations have been imported from foreign countries. It is logical to conclude that some animal diseases and parasite pests were imported with them. It is not logical that all the diseases or parasites were imported with the first animals but that they came at intervals with new importations until, it seems, nearly all of them have reached this country.

When one reviews the method by which the foundation animals and animals later imported for improvement were brought to the United States and distributed, in the light of present-day veterinary knowledge, it is not surprising that the country is infested with many animal parasites and disease germs. Much knowledge concerning diseases and parasites now available was not available during the periods when animals were being most extensively imported. As a result, such animals were secured from all parts of the European continent and distributed throughout the United States with little consideration of health precautions. The development of the centralized marketing system and the

extensive shipping of animals used for improvement purposes back and forth throughout the country provided the most favorable means of disseminating such infections. Add to this the ever-increasing density of animal populations and the ever-increasing maintenance of animals under close confinement and artificial conditions; is it any wonder that the animal health problem of today is a baffling one and that the animal industry suffers staggering losses from disease and parasites?

Progress in Veterinary Science.—Veterinary science may be defined as the science that deals with the prevention or cure of disease and alleviation of injury in animals. Before the rapid recent development of knowledge concerning communicable diseases, the principal service of the practicing veterinarian was assistance with cases of difficult parturition, treatment of disturbances of the digestive system, performing simple operations such as castration, and treating injuries. The discovery of bacteria and viruses as causes of disease stimulated the development of many research laboratories to study animal diseases throughout the world. As a result, accumulation of knowledge in the field of veterinary science has been extremely rapid during the last fifty years. Much progress has been made in studies of animal diseases of bacterial or virus origin, and much knowledge has been gained concerning the life histories of animal parasites. Since communicable diseases are the most devastating and costly of all animal ills, attention of the practicing veterinarian has been turned largely toward prevention and control of such diseases. Individual veterinarians, often failing to cooperate effectively with one another, made little progress in bringing communicable diseases under control. Constructive progress in this field did not begin until the Federal and state governments became interested in it through the establishment of the Federal Bureau of Animal Industry and the State Livestock Sanitary Boards.

Progress in Disease Control.—The Bureau of Animal Industry of the Department of Agriculture of the United States government was created by an act of Congress in 1884.[1] This marked the beginning of organized effort under legal authority to formulate rules for prevention of the spread of animal diseases in the United States. The Bureau of Animal Industry, or B.A.I., as

[1] MERRILOT, L. A., *Jour. Amer. Vet. Med. Assoc.*, 1935, vol. 87, p. 276.

it is commonly known throughout the country, has conducted many researches to gain new knowledge about animal diseases and has initiated many regulatory measures for disease and parasite control. To accomplish this end, many amendments to the original act creating the B.A.I. have been made by the Federal Congress.

Following the establishment of the B.A.I. by the Federal government, state governments formed state livestock sanitary boards and passed laws directed toward animal-disease control.[1] These have also been amended from time to time. Regulations of the B.A.I. apply only as they affect livestock in interstate or national commerce. Regulations of the state livestock sanitary boards apply only within the individual state.

One of the most progressive amendments to the act creating the B.A.I., especially from the standpoint of protection of human health, was the passage of the Meat Inspection Act of June 30, 1906, initiating ante mortem and post mortem inspection by qualified veterinarians of all meat animals slaughtered by processing plants doing an interstate business.[2]

Much credit for the progress in veterinary science during the last 75 years is due to individual veterinarians working through their professional organization, the American Veterinary Medical Association. Formed in 1863,[3] this organization has accomplished much in bringing about high standards of training for the profession. Many procedures resulting in progress in the control and elimination of diseases were first recommended by this association.

It was, however, through the setting up of the B.A.I. and the state livestock sanitary boards that the necessary cooperative effort in disease control was developed. It was liberal financing of these agencies as well as state veterinary experiment stations that led to a rapid accumulation of knowledge of how to cope with many of the disease problems. It was then through the passing of the necessary legislation, giving the sanitary agencies

[1] State Sanitary Requirements Governing Admission of Livestock, *U.S. Dept. Agr. Misc. Circ.* 14, 1938.

[2] Regulations Governing the Meat Inspection of the United States Department of Agriculture, U.S. Department of Agriculture, 1922 (*B.A.I. Order* 211, revised).

[3] MOHLER, JOHN R., Seventy-five Years of Progress in Veterinary Medicine, *Jour. Amer. Vet. Med. Assoc.*, vol. 93, p. 98, 1938.

authority to make rules by which the spread of disease could be halted, that progress was possible. Millions of dollars have been expended by Federal and state governments in financing research and control measures, and millions more have been paid to livestock producers in indemnities for animals condemned to slaughter in the program to eliminate sources of infection. As a result, the livestock of the United States is now considered the most healthy of that of all the countries of the world. This situation, together with the strict inspection of all food products of animal origin that is made by Federal, state, and city governments, assures to the people of the United States animal foods known to be free from disease infections and to be in the most wholesome condition possible. There are disease and parasite problems still to be solved. The promise is for still more rapid progress in solving them in the future than has been experienced in the past. Progress made in bringing a few of the more damaging diseases under control will illustrate the accomplishments to date and suggest what may be hoped for concerning others in the future.

Hog cholera is probably the most fatal and contagious of all animal diseases. Prior to the discovery of the serum and virus treatment for the immunization of hogs against infection with cholera, this disease caused the death of millions of hogs annually. Since the discovery in 1907 of the serum and virus treatment for the prevention of cholera by Drs. Dorset, McBryde, and Niles of the B.A.I.,[1] this disease has been brought under almost complete control and losses from it eliminated. Hog cholera is no longer a serious menance to swine producers.

Tuberculosis was for years the most serious and costly communicable disease of cattle. No practical cure for it has been discovered. Partly because tuberculosis of cattle is so costly to cattle producers and partly because it is transmissible to people through uncooked meat and raw milk, the United States government and all state governments for many years have centered much attention on the elimination of this disease. It was not until the bacillus of tuberculosis was discovered by Koch[2]

[1] Kernkamp, H. C. H., Hog Cholera, *Minn. Agr. Expt. Sta.*, *Spec. Bul.* 52, 1922.

[2] Diseases of Cattle, pp. 404–425, U.S. Department of Agriculture, Washington, D.C., 1904.

in 1882 and a method of testing cattle to determine whether or not they were infected with it was discovered by Koch, Bang, and others a few years later that it was possible to begin to bring the disease under control. Since 1900 two reliable methods of testing cattle to detect the presence of tuberculosis have been perfected. The eradication of tuberculosis was begun by testing purebred herds and making laws requiring the testing of purebred cattle for freedom from tuberculosis infection before they could be shipped from one state to another for use as breeding animals. Regulations governing the control of this disease have progressed through various measures, until now every head of cattle in the United States has been tested and those found infected have been slaughtered. By the area-testing plan,[1] the number of cattle in the country affected with tuberculosis has been reduced to less than one-half of 1 per cent. It is probable that in a few years more the disease will be completely eliminated.

The bringing of bovine tuberculosis under control in a country with a cattle population numbering 68,000,000 head is the greatest accomplishment in animal-disease eradication that has been attempted in any country in the world.

Splenetic fever, a highly fatal disease affecting cattle in the Southern states since 1867, for years defied the veterinary profession and caused great losses to cattle producers. Research conducted over a period of years by veterinarians working in the employ of the B.A.I. finally located the cattle tick as the sole carrier of this disease and began the gradual elimination of the tick by the area method of procedure.[2] Cattle are freed of ticks by dipping, and premises are freed of ticks by keeping cattle off them for a year and a half. By cooperating with the state livestock sanitary boards in the Southern tick-infested states and working thoroughly in a limited area each year, the country has now been completely freed of the cattle tick and splenetic fever except for one or two very small areas. It is planned that these areas will soon be cleared of the ticks and the country will be entirely free of the splenetic-fever disease of cattle.

[1] Unpublished data, Minnesota Livestock Sanitary Board, St. Paul, Minn., 1940.

[2] Diseases of Cattle, pp. 475–498, U.S. Department of Agriculture, Washington, D.C., 1923.

Scabies of cattle and sheep is a skin-parasite infestation that causes heavy loss because of the fact that animals heavily infested with the scabies mite become emaciated and unthrifty. Scabies of cattle and sheep have been brought under control by dipping in solutions that will kill the mite.[1] Through cooperative effort between the B.A.I., state livestock sanitary boards, and livestock producers, this is another serious animal affliction that is kept well under control, and annual losses from it have been nearly eliminated.

Dourine, swamp fever, and glanders, diseases of horses; anthrax, of cattle, sheep, and swine; blackleg and many types of parasites are now well understood and can be kept under control and their entrance into healthy herds prevented by skillful watching on the part of the animal caretaker and by rigid observance of rules prescribed by the livestock-health regulatory agencies.

Caretaker's Responsibility concerning Animal Health.—Producers have often failed to carry out necessary precautions against the introduction of disease into herds because they did not know about the existence of the disease or did not understand the seriousness of it. One of the most important duties of a successful animal caretaker of the present time is to acquaint himself with all available information about diseases and parasites and practice the most rigid observance of rules and regulations for elimination of a disease or parasite infestation present in a herd and to observe rules that will provide every possible precaution against introduction of diseases or parasites into a healthy herd.

Questions

1. Define care of animals; livestock management.
2. What factors give emphasis to the present importance of animal care?
3. Why is animal care continually becoming more complicated?
4. How do you account for the extensive spread of disease infections and parasite infestations throughout the United States?
5. Define veterinary science.
6. What important development led to a change in the work of the practicing veterinarian?
7. What is the function of the B.A.I. in connection with animal diseases? Of state livestock sanitary boards?
8. What discovery made possible the bringing of hog cholera under control?

[1] Diseases of Cattle, pp. 513–518, U.S. Department of Agriculture, Washington, D.C., 1923.

9. What was the significance of the area-testing plan in the control of tuberculosis? Of splenetic fever?

10. What is the caretaker's responsibility concerning animal health?

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CHAPTER V

THE MARKETING OF LIVESTOCK

When animals were first domesticated, nearly all the people lived on the land. There were no large cities. There was no need for a livestock marketing system. Each family produced what animals and animal products it used. The animals were slaughtered and the meat used by the families who produced it. As cities began to develop, people living in them had to give up the raising of animals and secure their meat and animal products from near-by farmers. In the beginning, the farmer slaughtered the animals and delivered the meat to the city resident.

Origin of the Butcher Shop.—It soon became evident that someone serving as a specialized slaughterer who would buy the live animals from the farmer, slaughter them, and sell the meat to the consumer could render a valuable service to both producer and consumer. Early in the growth of cities, the local butcher appeared to fill this need. In the beginning, his slaughter plant and selling place were located together. Most of the selling was done by taking some meat on a cart, canvassing from house to house, and selling the meat at the door of the consumer.[1] With further growth of cities, residents began to object to the smell and unsightliness of the slaughter places. The butcher was forced to move his slaughter place outside the congested areas and to maintain a separate selling place in the city. This required that the butcher look after three separate tasks, buying the animals, slaughtering them, and selling the meat.

Origin of the Meat Processor.—This situation led the butcher to employ a specialized slaughterer or workman who was especially skilled in the work of slaughtering the animals. This was a satisfactory solution of part of the problem except that many butchers did not have enough work to keep a specialized slaughterer fully employed. This problem was solved by two or more

[1] PLUMB, C. S., "Livestock Marketing," Ginn and Company, Boston, 1927.

butchers cooperating to have the slaughtering of their animals done at one place by the same man. It was probably the serving of two or more employers that brought about the thought that the slaughterer might own the slaughter place, buy the animals, and sell the meat to the butchers; at least, this was the next step in the development of livestock marketing. Since buying the animals and slaughtering them were the most difficult and unpleasant part of the butcher business, butchers were quick to approve and encourage this move. The transition in ownership of slaughtering places from the butcher to the slaughterer and the transfer of the buying of the livestock by the butcher to the slaughterer did not take place rapidly or generally but was a gradual growth, which is not yet entirely complete. There are still some butchers who own and operate their own slaughter places and buy their own livestock. They are the exception rather than the rule and are found generally in small towns. In the United States, through many years and many stages of development, a few of the small specialized slaughtering plants of early times became the giant meat-processing abattoirs of today.

Origin of the Drover or Livestock Buyer.—One of the reasons the butcher was willing to allow the slaughterer to become the buyer of the live animals was that as cities grew in size, animals had to be secured from greater distances, and it became difficult for the butcher to secure enough animals. The slaughterer, in turn, soon experienced this same problem. The first solution was the appearance of the specialized drover, as he was called in early days. Early livestock drovers operated as employees of the slaughterer, the butchers, or on their own account. They would go among producers, buying animals, and would drive them on foot to the slaughtering places. The fact that much of their time was employed in driving animals from farms to slaughtering plants explains the origin of the term "drover" as applied to them. The thousands of local buyers living at country points who make a living buying livestock from surrounding farmers and shipping it to market constitute the present-day development of this service to the livestock industry. Prior to the advent of railways in the United States, animals were purchased from as far west as Ohio, Indiana, Illinois, and Kentucky and driven to Eastern seaboard towns to be slaughtered. Since animals are now transported to market by rail or by truck, the term "drover"

has been dropped from common usage, and the former drover is now known as the "livestock buyer."

The Origin of Railway Transportation.—The advent of rail transportation was the first great stimulus to more effective marketing of animals and animal products. It not only made possible the economical and speedy transportation of live animals over long distances but brought about the development of livestock markets and processing centers in cities located in pro-

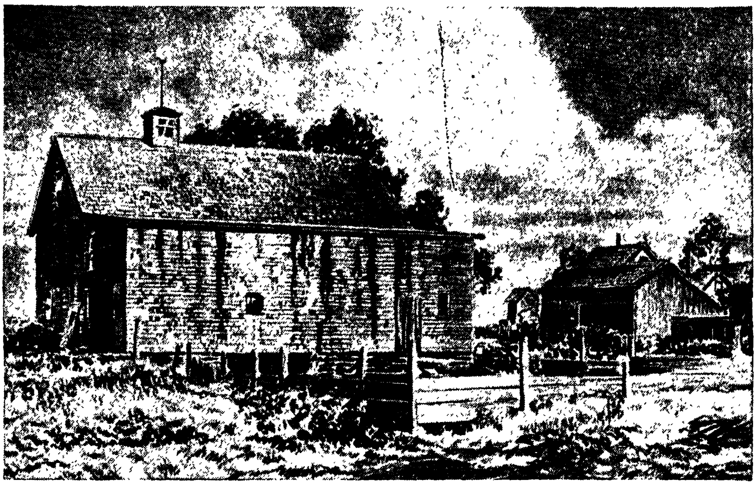

FIG. 3.—The first Swift and Company "packing plant." A slaughterhouse typical of the period 1800–1850. (*Courtesy of Swift and Company.*)

duction areas and the shipment of the dressed meats from producing areas to consuming centers. The first reported shipment of live animals by rail was a shipment of several carloads of cattle from Cincinnati to Cleveland, Ohio, in 1852.[1] Since the railways did not at first build stock cars, the cattle were loaded into box cars. The Pennsylvania Railway built the first freight cars constructed especially for the transportation of live animals in 1854.[2] By 1860, transportation of live animals by rail was a common practice.

Origin of the Large Processing Companies.—The first large meat-processing plants developed in production areas were pork-

[1] *Dept. Agr. Yearbook, U.S.*, 1908, p. 230.

[2] The Standard Livestock Car, pamphlet published by the Pennsylvania Railway Company, 1910.

packing plants only. This accounts for the name "packing plant" as still commonly applied to large meat-processing abattoirs rather than the term "processing plant," which much more accurately indicates the work of a present-day meat-packing company. The first large meat-processing companies were pork packers, because pork is largely cured in salt brine or dry salt before it is consumed. A large part of the work of the early pork-packing companies consisted of packing the product in brine in

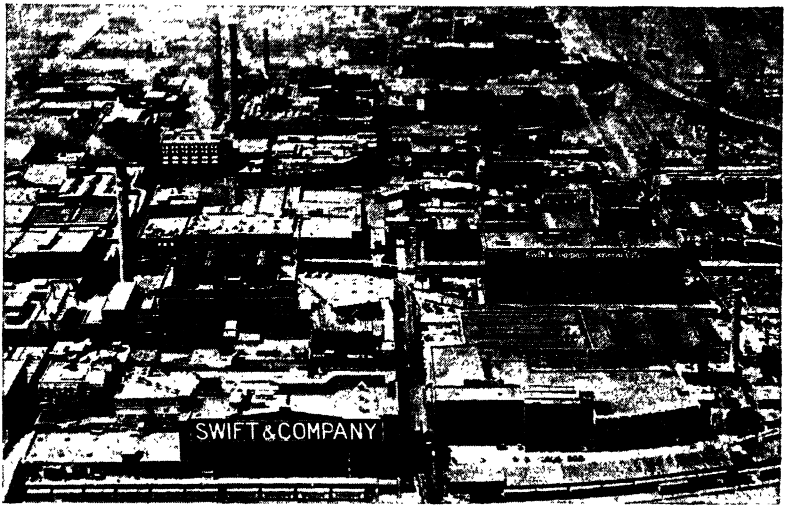

FIG. 4.—Bird's-eye view of Swift and Company, Chicago packing plant, 1941. Typical of modern packing plants. (*Courtesy of Swift and Company.*)

barrels or in dry salt in boxes for shipment. The curing process not only improves the flavor of pork but preserves it so that it may be kept for periods of several weeks or even months and can be transported without refrigeration. The use of refrigeration in processing plants and the use of the refrigerator car for the transportation of fresh meats did not begin until some years after the development of large pork-packing companies.

Beef, veal, mutton, and lamb, unlike pork, do not lend themselves readily to curing. Curing detracts from the taste of these meats so much that it has not been possible to develop a successful trade in them as cured meats. As a consequence, cattle, calves, sheep, and lambs continued to be shipped alive to slaughtering plants located near consuming centers until after the introduction

of the refrigerator car. Cincinnati, Ohio, became the first large pork-packing center in the United States during the period 1800–1850.[1] As hog production moved westward, Chicago came to be the center of a larger swine-producing area, and by 1860, Chicago had moved into first position as a center of pork packing.

Origin of the Chicago Union Stockyards.—Chicago was one of the first cities in the great livestock-producing area of the Central states to attain large size. This was because it is located at the southern tip of Lake Michigan and because it was the natural gateway from the east to the west. It was natural that it should become the first large railway center of this region. When railroads first began to transport livestock to Chicago to be sold, there was no Union Stockyards or central market place. Instead, each railroad maintained a terminal stockyards of its own. The livestock buyers traveled on horseback or in buggies from one to another of these terminals to make purchases. This was time-consuming, and a still greater problem arose in collecting the animals and delivering them to the slaughtering places. The situation was unsatisfactory to the shippers, since there were no agencies to look after their interests at the terminals. A need for a single market place, where the livestock and the buyers might be collected at one point and the handling, selling, and buying centralized, became evident in Chicago around the year 1860. This situation led to the organization of the Chicago Union Stockyards Company and the building of the Union Stockyards. The yards were built in 1865 and opened for business on Christmas Day. While the yards were being constructed, several packing companies were building processing plants near by. The creating of this central market place soon brought increased numbers of animals to Chicago to be sold and gave the Chicago packing companies their second great growth stimulus.

Origin of Commission Firms and Dealers.—With the opening of the central market at Chicago, the need for an agency to represent the shipper at the market became more evident. This need was filled by men who set themselves up as commission agents and offered to receive, feed, water, and sell animals for shippers, charging a small fee for this service. Because they were informed on market conditions, knew the buyers, and could easily

[1] Davenport, Arthur C., "The American Livestock Market," The Drovers Journal Publishing Company, Chicago, 1922.

earn their fee by rendering expert selling service, shippers soon began to patronize these agents.

With the opening of the large central markets, animals of all ages and all degrees of finish and fitness for slaughter began to arrive. Many were not suited to immediate slaughter. The commission firms found sale of such animals in small numbers difficult. It was evident that still another agency that would buy such animals as were not wanted by the packing companies or butchers was needed. There soon appeared a group of such dealers. During the years since they first appeared on the markets, they have been called "scalpers," "speculators," "traders," and other derisive names. They are legitimate dealers, because they buy and sell, investing their own money in the transaction. Their major volume of business has from the beginning been the purchase of feeder animals and milk cows. They buy in small or large numbers from the pens of commission firms, collect their purchases in a section of the stockyards assigned to them, sort the animals into uniform groups, and resell to whoever will buy. Most of the animals they buy are sold to farmers and shipped back to the country to be fattened or to be used as breeding stock or milk cows. Such dealers have always been a necessary and important agency in the successful functioning of any large central livestock market.

Refrigeration and Meat Processing.—The introduction of refrigeration and particularly of the refrigerated freight car in 1875 marked the beginning of successful and economical transportation of fresh meat over long distances. Following this date, abattoirs for the slaughter and processing of cattle and sheep developed not only in Chicago but in many other large cities strategically located in livestock-producing areas.

Spread of the Centralized Livestock-marketing System.—The centralized livestock-marketing system developed in the United States because, early in the history of the country, the population began to accumulate in large industrial centers and seaboard towns in the East, whereas the great livestock-producing areas in the Midwest, Southwest, and Western states remained sparsely settled. At present, 40,000,000 of the 130,085,000 people in the United States live in the section east of Ohio and north of Virginia. This area comprises but 7 per cent of the total land area of the country, but its population comprises 31 per cent of the

total. Much of the land in the area is mountainous or poor agricultural land and is not suited to extensive livestock production. There are other smaller areas, such as southern California, where the dense population requires that food products be shipped in from a distance. At present about 75 per cent of the meat animals are produced west of the Mississippi river, and 75 per cent of the meats are consumed east of it. Figuratively, it has been the function of the central markets and large processing companies to move this surplus of meat animals across the river. In practice, it has not been so simple as it sounds, because the animals have had to be gathered together from thousands of farms, sold to the processors, processed, and the meats distributed to thousands of consuming centers in surplus-consuming areas. For many reasons this can be most efficiently and economically accomplished by large-scale operation. It has always been an economic advantage to the large processing companies to have processing plants located near the supply of live animals. This accounts for the opening of new markets as new producing centers develop. At present the only animals shipped long distances to market as live animals for slaughter are a few hogs required in the fresh-pork trade and the cattle, sheep, and poultry required in the kosher trade.

TABLE III.—FEDERALLY INSPECTED SLAUGHTER OF ANIMALS IN THE UNITED STATES, 1938*

Kind	Number
Cattle	14,743,000
Calves	9,117,000
Hogs	59,089,000
Sheep and lambs	22,518,000

* *U.S. Dept. Agr. Livestock, Meats and Wool, Market Statistics*, 1939.

As new markets developed, they were all patterned after the first one at Chicago. Factors other than the concentration of animals in production areas determine the specific location of the market in the area. Some of the more important of these are (1) that there be a worth-while market for meats near by, (2) that there be an adjacent stream of water for sewage disposal, (3) that the location have good railway facilities. Because of their favorable locations, the larger markets are at Chicago, St. Louis, Kansas City, Omaha, St. Paul, Sioux City, St. Joseph, Denver, and Fort Worth. There are now a total of 69 livestock

markets in the United States, all patterned after the first central market at Chicago.

TABLE IV.—TOTAL LIVESTOCK RECEIPTS IN SEVERAL LEADING MARKETS, 1939*

Market	Cattle	Calves	Sheep	Hogs	Horses
Chicago	1,818,494	312,052	2,498,869	4,263,810	7,948
Omaha	1,183,802	128,153	1,716,920	1,629,276	10,095
St. Joseph	313,480	58,404	1,025,079	822,377	1,480
Sioux City	672,599	60,199	710,963	1,203,437	9,703
Fort Worth	620,062	422,041	938,729	355,111	30,570
Denver	509,425	112,412	2,836,820	341,799	6,710
Kansas City	1,387,000	325,075	1,366,593	519,298	30,866
South St. Paul	892,690	480,374	1,203,959	2,204,915	8,508
Total, 69 markets, 1938	14,075,548	6,563,390	25,597,757	24,801,011	360,934

* *U.S. Dept. Agr. Livestock, Meats and Wool, Market Statistics*, 1939.

Distribution of the Consumer's Meat Dollar.—The centralized marketing system and the large processing companies have provided to producers and consumers of meats in the United States the most efficient marketing of meat animals and distribution of meats to be found in any country in the world. Generally six agencies are involved in collecting the animals, slaughtering and processing them, and distributing the meats to the consumers. The agencies are (1) the local buyer or collecting agency, (2) the transportation agency, (3) the stockyards company, (4) the commission company, (5) the processing company, and (6) the meat retailer.

Each of these agencies must receive compensation for its service. A study of the charges levied by the respective agencies shows that of the consumer's dollar, local buyers, stockyards companies, and commission firms together receive from 5 to 10 per cent; transportation agencies, 8 to 20 per cent; the processor, 10 to 20 per cent; and the retailer, 20 to 35 per cent. The transportation costs cover movement of the live animal to the market center and movement of the meat from the processing plant to the retail meat shop. This leaves for the producer a percentage, which under the most unfavorable circumstances likely to prevail amounts to about 34 per cent of the consumer's dollar and under the most favorable circumstances, to 66 per

cent. The wide variation in the percentage of the consumer's dollar that finds its way back to the producer is due to many fluctuating influences. The two principal influences are the distance from the producer to the consumer market and the wide variation that occurs from time to time in meat prices. The variation in prices is due to the combined influence of variations in the supply of meat animals and in consumer buying power.

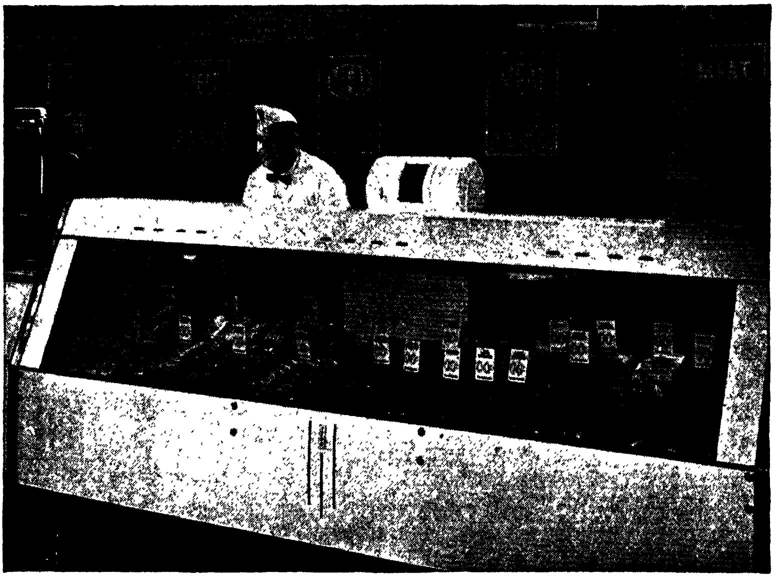

FIG. 5.—Refrigerated glass-front display counters in retail meat shops simplify the problems of both the shopper and salesman. (*Courtesy of National Livestock and Meat Board.*)

Operating costs of the various agencies in the marketing system are rather stationary and cannot be lowered rapidly when meat prices decline; neither do they advance rapidly when meat prices rise. Ironical as it may seem, the producer receives the smallest percentage of the consumer's dollar when meat prices are low and the largest percentage when meat prices are high. Over nearly any period of 10 years or more, the producer's percentage of the consumer's dollar will average between 51 and 54 per cent.

Market Reports.—The need of a market-reporting service became apparent early in the development of trade in animals and animal products. In the United States many plans for the collection and distribution of market reports have been developed.

Many daily newspapers publish market reports, because at least a part of their readers are interested in them. In the earlier days, such publications had to secure their market information as best they could. As a result, early market reports were often fragmentary and inaccurate. Agricultural journals and farm papers have generally carried a page of livestock-market reports, but intervals between dates of publication of such periodicals range from a week to a month, so that the usefulness of such market reports is limited. Many livestock commission firms follow the practice of sending out a weekly market report in the form of a printed letter or circular, partly as a service to their patrons and partly as an advertising medium.

Specialized Daily Market Papers.—Following the origin of the central markets, persons interested in their success promoted the publication of specialized market-reporting journals. Such publications were set up as daily papers and were expected to support themselves financially and make money for the stockholders. They employed a staff of reporters who would visit the market to collect first-hand information concerning actual sales, as well as statistics on numbers of animals arriving and other items concerning market conditions that would be of interest to producers, shippers, salesmen, and buyers. Subscription lists were built up among patrons of the market. Daily market-reporting papers have given satisfactory service and succeeded financially at the larger markets but have not been so successful at the smaller ones. Following the establishment of the market dailies, most other papers publishing market reports secured the information, from them. The *Chicago Daily Drovers Journal*, first published in 1873, the *Kansas City Daily Drovers Telegram*, in 1882, the *Omaha Daily Drovers Journal Stockman*, in 1887, and the *St. Louis Daily National Livestock Reporter*, in 1890, are examples of the daily market-report papers.[1]

Market Classes and Grades.—A system of classes and grades is an essential background for a useful market report for any commodity. Marketing agencies have been backward in establishing a uniform set of market classes and grades for livestock. This has been due partly to the fact that livestock cannot be satisfactorily covered by a simple set of classes and grades and that

[1] Davenport, A. C., "The American Livestock Market," Drovers Journal Publishing Company, Chicago, 1922.

buyers of livestock depend almost entirely upon personal inspection of each animal or group of animals in arriving at a price to be offered for them. Through necessity for market reporting during the period 1850–1900, a list of terms for describing the kind and quality of animals being marketed came into use.

During the decade 1900–1910, the Illinois Agricultural Experiment Station published several bulletins explaining the advantages and uses that might be made of a uniform set of classes and grades for each of the several kinds of commercial livestock. The bulletins recommended classes and grades for each of the several kinds of livestock based on the terminology then in use on the Chicago and St. Louis markets.[1] The book "Types and Market Classes of Livestock," by Vaughan,[2] published in 1915, also presented sets of classes and grades as used on the Chicago market. These publications helped materially to develop a better understanding of how to interpret market reports on the part of producers.

The Federal Livestock Market-reporting Service. Although the Illinois bulletins and Vaughan's book contributed much toward clarifying the terminology and extending the use of market classes and grades, producers still lacked accurate information concerning what was going on at the large market centers of the country. Also, markets differed in the interpretation of requirements of classes and grades of animals. For example, a steer might be generally considered by all market agencies as a "good slaughter steer" at the St. Paul market, but the same steer might fall far short of qualifying as a "good slaughter steer" at the Chicago market.

At the request of the American National Livestock Association, the National Livestock Exchange, and other organizations concerned in the production and marketing of livestock and animal products, the U.S. Department of Agriculture became interested and initiated investigations in the livestock marketing field,

[1] MUMFORD, H. W., Market Classes and Grades of Cattle, *Ill. Agr. Expt. Sta. Bul.* 78, 1902. DIETRICH, WM., Market Classes and Grades of Swine, *Ill. Agr. Expt. Sta. Bul.* 97, 1904. OBRECHT, R. C., Market Classes and Grades of Horses and Mules, *Ill. Agr. Expt. Sta. Bul.* 122, 1908. COFFEY, W. C., Market Classes and Grades of Sheep, *Ill. Agr. Expt. Sta. Bul.* 129, 1908.

[2] VAUGHAN, H. W., "Types and Market Classes of Livestock," R. G. Adams & Co., Columbus, Ohio, 1915.

beginning in 1916. The Agricultural Appropriation Act passed by the Federal Congress in August, 1916, provided the first special funds to the Department of Agriculture for the purpose of making a study of the methods in practice, costs of marketing, sources of supplies, accuracy and use of market reports, and variations in prices of livestock and livestock products at the large market centers. The investigations soon led to the organization of a major project in the department for the purpose of providing for producers, dealers, consumers, and others accurate, timely, unbiased, and uniformly interpretable market information. The project was placed under the Bureau of Agricultural Economics of the U.S. Department of Agriculture for administration. In building up its news agency, the Bureau of Agricultural Economics set about first to develop a standard set of classes and grades for all kinds of livestock and livestock products that would apply uniformly to all markets throughout the country. It has constantly striven to refine, strengthen, and bring into general understanding the terminology used so that, for example, a steer that would grade a good slaughter steer on the St. Paul market would also grade a good slaughter steer on every other market in the country.[1]

In the beginning there was considerable objection on the part of many market agencies to the entrance of the government into the field of livestock market reporting. This work had not gone far, however, until it became evident to producers and many others that the government could do a better job of collecting data for market reports, issuing such reports, and giving them wide distribution than had been done previously by private interests. Soon more and more people became convinced of the value of the government service in this field, and greater demands were made until now the government-recommended classes and grades are in general use throughout the country, and the market reports collected and prepared by the Federal market-reporting service are the basis of practically all market reports.

Livestock-market-reporting offices are now maintained at 31 different livestock markets in the United States. They are connected by a system of leased telegraph wires so that the central office in Washington, D.C., as well as each of the 31 branch offices,

[1] Unpublished data, U.S. Department of Agriculture, Washington, D.C., 1940.

receives several reports daily from every other office, and any office can put out a report giving information not only from its own market but from all other markets in the system as well. Use of the radio in disseminating market information has simplified greatly getting accurate market information distributed quickly and effectively. At present any farmer who has even the simplest, most inexpensive radio in his home may secure the benefits of this great livestock-market-reporting service covering practically the entire country. The farmer's greatest handicap in making use of market reports is a lack of knowledge of how to interpret the terminology and class and grade limitations to apply to his own animals that he wishes to offer for sale. Information about how to do this, however, is available all around him, and it is his responsibility to educate himself in this field.

In 1938 all market-reporting services being carried on by the U.S. Department of Agriculture were grouped together and are now administered by the Agricultural Marketing Service of the department rather than by the Bureau of Agricultural Economics.

Cooperative Marketing.—The cooperative marketing of livestock is one of the newer developments in marketing procedure. Growth of this marketing plan has been rapid. Approximately 25 per cent of all commercial livestock sold annually in the United States is marketed cooperatively.

The Cooperative Shipping Association.—The cooperative marketing movement had its inception during the days preceding truck transportation and direct buying, when in mixed farming areas nearly all livestock was purchased from the producer by local buyers and consigned by them to commission firms at the central markets. The incentive to the first step in the development of cooperative marketing was a belief on the part of producers that they were not getting full value for their livestock from the local buyers. The objective of the shipping association was to circumvent the local buyer by consigning the livestock directly to the commission firms on the central markets. To accomplish this, the smaller producers had to group together in order that shipments of full carloads of stock might be made, since many producers had less than carload lots to market. The larger producers and ranchers of the West were already following

the plan of consigning carload shipments direct to the commission firms.

It is maintained that the Grange and the Farmers' Alliance organizations encouraged and conducted the cooperative shipping of livestock as early as during the decade 1870–1880.[1] The first cooperative shipping association of which there is factual record was organized independently by a group of farmers at Superior, Neb., in 1883. In later years, the organization of shipping associations was promoted by such agencies as the American Society of Equity, the Farmers' Union, Farmers' Elevator Organizations, the Farm Bureau, the Agricultural College Extension Divisions, and the U.S. Department of Agriculture. Once the shipping-association movement was given publicity, growth in the number of associations was rapid. In 1916, there were 500 local associations and in 1920, 2,000 such associations in the United States.

Cooperative Selling Agencies.—It was during the First World War period 1914–1918 that producers patronizing local livestock shipping associations began to believe they were not getting as competent service from the commission firms on the central markets as they should. The proposal that shipping associations organize their own selling agencies to receive and sell their livestock on the central markets was advanced. Action on this proposal was first taken in Minnesota, where a state federation of livestock shipping associations had been organized. This federation organized and on May 11, 1921, incorporated the Central Cooperative Commission Association[2] to serve as the selling agency on the market at South St. Paul for cooperative livestock shipping associations in Minnesota and surrounding states. This selling agency opened for business Aug. 8, 1921. Within a year it was receiving and selling 25 per cent of all of the livestock arriving at the South St. Paul market. Through promotion by the American Farm Bureau Federation, cooperative selling agencies were soon established on about fifteen other central markets, and about fifteen such agencies were organized by the Farmers' Union. For the most part the Farm Bureau and Farmers' Union avoided establishing agencies on the same

[1] NOURSE, E. G., and J. G. KNAPP, "The Cooperative Marketing of Livestock," Brookings Institution, Washington, D.C., 1931.

[2] Name later changed to Central Cooperative Association.

markets. By 1930, these and other cooperative selling agencies were handling about 25 per cent of the receipts of livestock at the more important markets.

In 1929 and 1930, the Federal government, through the Federal Farm Board, attempted to bring all cooperative livestock-marketing organizations into one national association. This attempt failed, largely because of rivalry between the Farm Bureau and the Farmer's Union organizations. As a result, cooperative selling of livestock has continued to function with the agency at each market operating quite independent of any overhead influence. At several markets there are two or more cooperative agencies representing different groups of producers. Individual farmers may consign their livestock to any of these agencies through a local shipping association, or they may become a member of the central selling agency as an individual and consign directly to the central selling agency. Much of the livestock now sold by the cooperative agencies is consigned directly to them by producers and does not pass through a local shipping association.

Direct Selling by Cooperative Organizations.—In certain sections of the country, notably in Ohio and California, local cooperative shipping associations have developed direct selling to packing companies without passing their livestock through a central market or through the hands of the cooperative selling agencies located on them. This plan has met with a fair degree of success.

Local Processing and Direct Buying.—Before large cities, industrial centers, and railways appeared, many small slaughtering plants, owned largely by retail butchers, were maintained throughout the country. Most of these disappeared with the advent of the large processing companies. Some continued, and some new ones came into existence, generally adjacent to towns of sufficient size to provide an appreciable market for meat. Insofar as they can, the small processing companies buy live animals at their plants as producers truck or ship them in. Often they find it necessary to send buyers out some distance to make purchases in order to secure sufficient animals to supply their trade.

Theoretically, there is a place for the small processing company in densely populated areas as well as in the heavy producing areas. In densely populated areas, the small processor should

have an advantage in processing the local supply of livestock and distributing it as far as it goes. In heavy producing areas, local processors should have an economic advantage over large processing companies in processing and distributing that percentage of the livestock required in the local trade. The large companies might be expected to have an advantage in attracting the surplus animals from heavy producing areas to large market centers and in processing and distributing the product over long distances to consuming centers. In practice, the processing and distributing of meat do not work out just that way. The tendency has been for some of the small processing plants to grow to such size that they must enter into national competition with the large companies to dispose of surplus product. The branch-house and car-route systems of the large companies have made their products available to practically every retail meat dealer in the country so that they can compete with the small local processor right in his own local territory, wherever that may be.

Because the large processing companies were compelled to sell a large part of their product to the Allied armies during the First World War, the small companies were able to make rapid growth. By the end of the war, the smaller companies were cutting in appreciably on the supplies of live animals formerly sent to the large central markets. In order to meet this buying competition, the large processing companies began in various ways to buy animals at local points for shipment direct to their processing plants located at the central markets. Local buying by both small and large processing companies has increased rapidly during the last twenty years. Since animals purchased in this way are delivered directly to the slaughtering plant of the purchaser and do not pass through the large markets, this method of buying has been designated "direct buying." The rapid increase of direct buying during recent years has reduced the number of live animals that pass through the central markets. The influence of this change in buying practice upon the net price received by the producer has been the subject of much controversial discussion.

The Packers and Stockyards Act.—A belief on the part of producers and others during the period of wide price fluctuations during and immediately following the close of the First World War that, all practices on the large markets were not just what

they should be led to the passage by the Federal Congress on Aug. 15, 1921, of the Packers and Stockyards Act.[1] This was an act declaring it unlawful for meat packers to engage in unfair, discriminating, or deceptive practices tending to restrain trade or create a monopoly or to indulge in practices having the effect of manipulating or controlling prices. The law also declares that all rates charged by stockyards companies and market agencies shall be just, reasonable, and nondiscriminatory. The Secretary of Agriculture was empowered by the law to set up rules and regulations and a staff of employees to supervise and carry out the provisions of the law.

There has always been a question in the minds of many people as to whether such a law was needed or not and a question as to how much it has accomplished for the betterment of livestock marketing practices. During the years since its passage, however, many cases of violations of its provisions have been called to the attention of the Secretary of Agriculture and been ruled on by him. Many of these rulings have been taken into court, and in many cases, the ruling of the secretary has been sustained. In some cases it has not. The fact that in 1938, 132 cases[2] were given final ruling and at the end of the year 39 were pending lends support to the probable need for such Federal supervision of livestock markets.

From the time of its passage until 1938, the Packers and Stockyards Act was administered by the B.A.I. Since October, 1938, it has been administered by the Agricultural Marketing Service of the U.S. Department of Agriculture.

Truck Transportation.—The hauling of livestock from farm to market in motor trucks was begun about the year 1910. This method of transportation of live animals developed rather slowly until about 1925. Handicapped at first by the lack of suitable trucks and by poor country roads, truck transportation quickly came into favor with producers when more suitable trucks were made and improvement in country roads made it possible to operate them at high speed. Increasing rapidly and steadily since 1925, truck transportation of livestock has replaced rail

[1] Packers and Stockyards Act of 1921, U.S. Department of Agriculture, Washington, D.C., 1938.

[2] Report of Chief of the Agricultural Marketing Service, U.S. Department of Agriculture, Washington, D.C., 1939.

FIG. 6.—Section of cattle pens in Union Stock Yards, South St. Paul, Minn., Note large number of small pens necessary for handling small truckload shipments. (*Courtesy of Central Cooperative Association, South St. Paul, Minn.*)

transportation almost 100 per cent on hauls up to 50 miles, 85 per cent on hauls up to 100 miles, 75 per cent on hauls up to 150 miles, and 50 per cent on hauls up to 200 miles. Much livestock is transported to market by truck over distances above 200 miles. At many of the smaller markets, upward of 95 per cent of all livestock receipts now arrive by truck, and even at the large central markets from 35 to 90 per cent of the receipts arrive by truck.

Advantages of Truck Transportation.—Very poorly suited to the hauling of live animals when they first began to be used, trucks have been improved until now the majority of them provide comfort to the animals equal to that of the railway stock car, and on short hauls the time of crowded confinement en route is reduced by several hours. The larger semitrailer-type trucks have a load capacity nearly equal to the standard 36-ft. railway livestock car.

Producers favor truck transportation primarily because of its convenience. It facilitates the sending to market of less than carload shipments and eliminates the delivery of animals from the farm to the railway shipping point.

TABLE V.—PERCENTAGE OF RECEIPTS ARRIVING BY TRUCK, AT EIGHT PRINCIPAL MARKETS, 1939

City	Per Cent
Chicago	37
Omaha	50
Sioux City	75
St. Joseph	62
Fort Worth	80
Kansas City	39
Denver	17
South St. Paul	66

A cash saving is sometimes made in the transporation costs, especially on the short hauls. There is generally very little difference between the cost of the two types of transportation and very little difference in the amount of shrinkage in weight of animals en route.

Truck Transportation and Stockyards Management.—During the transition period from rail to truck transportation, stockyards companies have been forced to do a great deal of remodeling of the yards. They had to provide unloading chutes suitable for trucks. Large pens had to be divided to create more small

ones to facilitate yarding the larger number of small shipments. Increased facilities for weighing had to be provided and more men employed to handle the work. Although operating costs were thus being increased, their incomes were being reduced. It has always been the practice of stockyards companies to secure part of their income from a per head yardage charge on incoming animals and part of it from a profit on the feed supplied. Animals arriving by rail were always fed before being offered for sale. Animals delivered by truck often arrived at the market a few hours after leaving the farm, and truck shippers soon began to ask their commission firms to sell without feeding, thus eliminating the charge for feed. These changes necessitated a readjustment of stockyard charges. The yardage charges were revised upward and the feeding charges downward.

Truck Transportation and Interior Processing Plants.—Truck transportation has had a marked influence on the development of small packing companies located at interior points. So long as livestock had to be loaded on railway cars, producers were inclined to send it on to a central market, but when it became possible to deliver animals direct from the farm to a local packing plant, often in the farmer's own truck, producers soon began to patronize the local plants. By so doing they could avoid the railway freight charge as well as central market charges. The truck made it easy for local plants to secure supplies. This proved a decided stimulus to their growth. Stockyard companies at central markets have been practically helpless in attempts to meet this competition. Large packing companies have partially met it by buying some of the local interior plants and operating them, by building some new plants at interior locations, and by arranging for direct purchase at country points of part of the supplies for their large plants located at the central markets.

The trend toward decentralization of livestock slaughter has continued slowly but steadily through the last twenty years. As a result, the annual receipts of animals at practically all large central livestock markets have declined. The extent of the decline is as high as 25 per cent of the 1920 volume at some of the larger markets. Whether this trend toward decentralization of the large markets will continue remains to be seen. It is, however, probable that the task of moving the 50 per cent surplus of

meat animals from west of the Mississippi River to the surplus-consuming areas east of the river will be accomplished largely through the central marketing system for some time to come.

Organization and Regulation of Truck Transportation.—Millions of animals are now transported annually from farm to market in motor trucks, but livestock trucking as a business or transportation system is not yet highly standardized or organized. Trucks of many varying sizes and degrees of suitability are used. Some are owned by producers. Many are owned by local citizens who reside in small country towns and make a living by owning and operating one or two trucks. Many such local truckers are also buyers and will either transport for or buy livestock from farmers in their community. Some truck lines owning and operating several trucks have been organized, but such companies are generally unable to keep trucks and drivers busy regularly and find it difficult to succeed financially. Trucking rates in custom transportation come under the regulation of the Interstate Commerce Commission. Custom truckers are required to carry insurance to protect the shipper against possible loss en route. There is still opportunity for improvement in many features of truck transportation. It is probable that this method of transporting livestock will continue to increase and improve in the future.

Selling Purebred Animals.—The selling of purebred animals as breeding stock presents a different problem from the selling of commercial livestock for two reasons: (1) There are no public market places where purebred animals may be sent to be sold on their merits as breeding stock. (2) There is no classification and grading system for purebreds or price-reporting plan from which values may be determined. All agencies at the large central markets have shown an enthusiastic interest in livestock improvement through breeding and in the welfare of the pure breeds and purebred breeders. At many markets occasional auction sales of purebred animals have been promoted, generally by the stockyards companies, and at some of the larger markets large exhibitions of purebred animals have been promoted and their financing guaranteed by the market agencies. The International Livestock Exposition at Chicago and the American Royal Livestock Exposition at Kansas City are illustrations of such exhibitions. No one has, however, attempted to set up a selling agency at a

central market that would receive purebred animals any time they might be sent in and attempt to sell them as breeding stock.

The producer of purebred livestock must be his own salesman. He must in some way attract and contact the purchaser and deal directly with him. He must decide upon the price at which he will sell. As a result of this situation, the breeder of purebreds who hopes to succeed financially must be a good salesman as well as a producer of good animals.

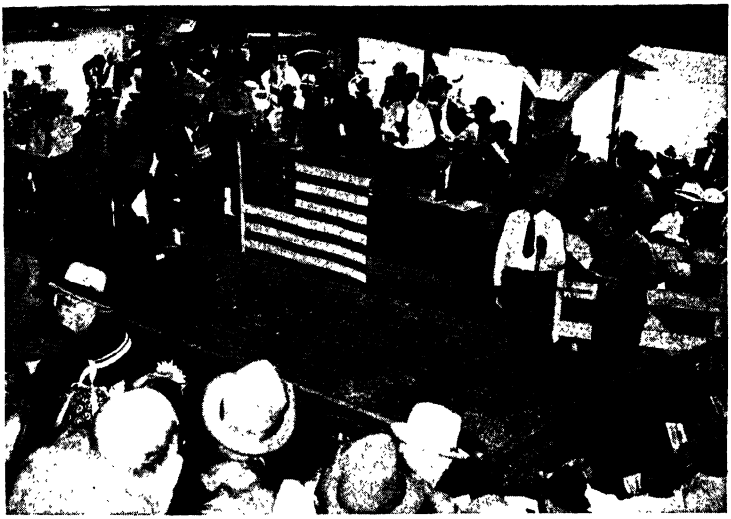

FIG. 7.—Scene at Edellyn Farms, Wilson, Ill., Shorthorn cattle sale, June 2, 1941. The auction is a popular method of selling purebred livestock. (*Courtesy of The Shorthorn World.*)

Many procedures in selling purebred animals have been developed. All of them may be classed under one of three principal selling plans: (1) sale by mail order, (2) sale by direct barter, and (3) sale by auction. Sales by mail order are accomplished by advertising in livestock or farm journals, thus attracting inquiries and finally closing the deal through correspondence. This plan is used mostly in selling poultry, hogs, and sheep.

Sales by private barter are based on many methods of attracting the prospective purchaser to visit the farm of the breeder. Then, after inspecting the animals being offered for sale, dealing is accomplished by discussing price directly. More purebred

cattle and horses are sold by this plan than by mail order and auction combined.

The auction plan of selling is practiced extensively by purebred livestock breeders. Its use requires that a considerable number of animals be offered at a given time and place. The number must be large enough to justify the expense of conducting the auction. Certain expenses are necessarily incurred. There must be seating space for the prospective buyers; an auctioneer must be hired, a catalogue printed, and the sale must be advertised. It is difficult to hold the expense of conducting a worthwhile auction below about $400. From two to three times that amount is expended on some auctions. Somewhere in between 40 and 60 animals is the number generally adhered to for 1-day auctions.

Comparatively few breeders of cattle or horses have large enough herds to hold a successful annual auction alone. Combination auction sales by two or more breeders are frequently held. Consignment auctions are also promoted by district, county, and state breeders' associations and by national livestock-record associations. There is, therefore, generally an opportunity for the small breeder to use this plan of selling if he chooses. Prices paid at the better auction sales are generally reported in breed journals and other farm papers. These sale reports come the nearest to providing a market report for purebred animals of anything now available.

Questions

1. Explain the origin and services performed by each of the following agencies: the first butcher shops; the first processors; the drovers or livestock buyers.

2. When did railroads begin to transport live animals?

3. State the important influences of railway transportation upon the methods followed in the marketing of livestock.

4. Why were the first large processing plants largely pork-packing plants?

5. Explain the situation that led to the organization of the Chicago Union Stockyards Company.

6. What needs in the functioning of a large livestock market gave rise to the commission firms? The dealers?

7. What was the influence of refrigeration, particularly the refrigerator car, on the procedure in livestock marketing and meat distribution?

8. How may the early development of a few large central markets and a few large processing companies, rather than many small markets and small processing companies, be explained?

9. List the several agencies through whose hands the animals or their products pass on their way from producer to consumer.

10. Approximately what percentage of the consumer dollar is received by livestock producers?

11. Why are market reports essential to the most successful functioning of any livestock marketing system?

12. Outline the development of livestock market reporting in the United States.

13. What is the need for a standard list of classes and grades of livestock?

14. Explain how the Federal Market Reporting Service functions.

15. What circumstances prompted the organization of livestock shipping associations?

16. Why did the shipping associations originate their own selling agencies?

17. What is meant by direct selling by cooperative associations?

18. What are the primary objectives of cooperative marketing?

19. Why have local processing companies come into prominence since 1920?

20. What is their relation to direct buying?

21. Explain the Packers and Stockyards Act.

22. What are the advantages of transportation of livestock to market by truck?

23. Approximately what percentage of livestock is transported to the large markets by truck?

24. To what extent is truck transportation regulated and by whom?

25. How does the selling of purebred livestock for use as breeding stock differ from the selling of commercial animals?

26. State the three common methods of selling purebred livestock.

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CHAPTER VI

SELECTING THE LIVESTOCK ENTERPRISE

Many factors combine to determine just what type of livestock enterprise will succeed best on a given farm. To succeed, each farmer must weigh carefully the probable influence of each of these factors.

It has been said that to succeed with livestock, one must have a definite liking for the kind and type of animal he is producing. It is true that a sincere liking for the type of animals with which one is working will stimulate enthusiasm, interest, and industry in the work of caring for them, but this alone will not go far toward overcoming natural or economic obstacles standing in the way of success. The major factors that must influence the wise selection of the livestock enterprise may be divided into two groups: (1) natural conditions and (2) economic conditions. Under natural conditions are included such influences as the fertility of the soil, the topography of the area, and the climate. Under economic conditions are included such factors as market for the product, requirement and availability of labor, and requirement and availability of capital.

Regional Production.—In the United States the foregoing influences operating singly or in combination have caused the intensification of production of each of the several kinds of livestock in certain areas. Careful inspection of the maps and figures showing the distribution of kinds of livestock gives a comprehensive picture of the areas of greatest concentration of production of each kind. Such areas of concentrated production did not just happen. There are both natural and economic reasons for them. The factors causing the concentrations can best be analyzed by considering each kind of animal separately.

Swine.—The distribution maps presented in this chapter show that the concentration of swine production in the central Mississippi Valley or Corn Belt area is the most intense of all the concentration areas for all types of livestock. This is because the

crop best adapted to this locality is corn, and generally the most profitable method of marketing corn is to feed it to hogs. The natural conditions of fertile soil, a high percentage of level or slightly rolling land, about the right amount of rainfall, about the right temperature, and favorable length of growing season make the central Mississippi Valley the most favorable corn-growing area in the world. The only other areas that compare with it are a small area in the Argentine and a small area in southeast Russia. Corn and hogs are an ideal complementary combination in this region, because corn is the best basic feed for the hog and

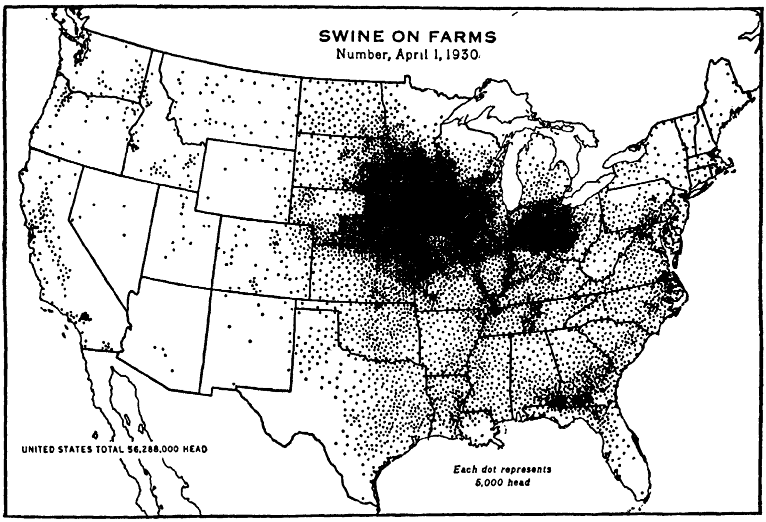

FIG. 8.—Showing distribution of swine on farms, 1930. Note concentration in Corn Belt states. (*Courtesy of U.S. Department of Agriculture, Bureau of Agricultural Economics.*)

the hog is the best market outlet for corn. Hogs utilize corn more efficiently than any other type of farm animal. As a farm product in this region, hogs have an economic advantage in that pork is a highly concentrated product of high value and when processed and cured it is comparatively nonperishable and can be economically transported long distances to market.

The United States has never imported pork in appreciable quantities. Pork produced largely in the Corn Belt has had the entire consumer demand in the United States as its market and at times a large export trade besides, yet the Corn Belt has never reached its maximum capacity in hog production. This is

because this area has such a large capacity to produce hogs that always before its maximum production is reached, the market is oversupplied, and the price drops so low that hog production is rendered unprofitable until the numbers are reduced.

Beef Cattle.—There are two intensified beef-cattle-producing areas, the semiarid and mountainous region of the West and the Corn Belt area. To a certain extent, the two areas carry out two different stages of beef production. In the semiarid and mountainous area, the lands are too rough or the rainfall too light to permit profitable cultivation. Beef cattle are used to

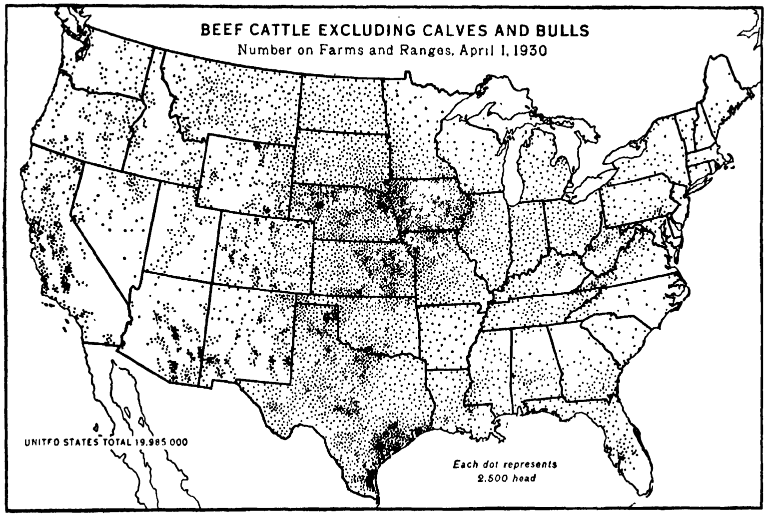

Fig. 9.—Showing distribution of beef cattle on farms, 1930. Note concentration in Corn Belt and dense population in range states. (*Courtesy of U.S. Department of Agriculture, Bureau of Agricultural Economics.*)

graze the natural grasses from this area because they are good grazers, they are hardy, and they require little labor in proportion to their value. The grazing area is a long distance from the consumer market, but beef cattle constitute a product of high value in proportion to the freight and marketing costs.

The range area completes only the first of two stages in modern beef production, the raising of the calf to the feeder age.

The production of beef of the very best quality requires that the steer or heifer be fed through a 3- to 6-month fattening period on grain before slaughter. Feeds suited for fattening cannot be grown economically in the range area. Corn is the best feed

for fattening beef cattle, just as it is the best feed for hogs. The Corn Belt lies to the east and north of the range area. The great beef-consuming area is east and north of the Corn Belt. It would, therefore, not be sound economy to ship corn west to the ranches and ship the finished beef back over the same route. Instead, the thin cattle are shipped eastward and northward from the ranches to Corn Belt farms, where they are fattened on surplus corn plus a little roughage grown on the farms.

Many beef cow herds are also maintained in the Corn Belt area. They are most commonly found on the larger farms and farms on which there is some land better suited to pasture than to cultivation. On such farms beef cattle are often supplementary to hogs, because they utilize roughage that the hogs cannot. They are often used on large farms because of their low labor requirement. Beef-cattle producers have always held practically the entire United States market and at times have had a considerable export market in addition.

Dairy Cattle.—The dairy-cattle distribution map shows that dairying is concentrated in the North Central and Northeastern states. This region, for the most part, is just north of the northern edge of the Corn Belt. Several factors combine to bring about the intensification of dairying in this area. There are many large industrial cities in this section of the country. In the early development of dairying there was an advantage in having the dairy farm located near the consuming market, because milk and cream are highly perishable products, and before the advent of hard-surfaced roads and the motor truck, a short haul to market was essential if the products were to be delivered to the consumer in good condition. Truck transportation, hard-surfaced roads, and the use of refrigeration in handling milk have extended the economical distance the dairy farm selling milk and cream for table use can be located from the consumer market to as far as 100 miles.

The development of local creameries for butter making in producing areas has eliminated the need for proximity to market of the dairy farm producing cream for butter making. As a result, dairy farms of this type now gain more in economy of production by being located at a distance from large cities than they lose in increased transportation cost. Butter is a product of high value and, handled under refrigeration, is comparatively

nonperishable and can be successfully shipped long distances and held in storage for a considerable period of time without deteriorating in value. The same economy holds for cheese making, and dairy farms selling milk for cheese making are most advantageously located at a distance from large consuming centers rather than close to them. This advantage gained for the butter- and cheese-producing farms, with modern development in transportation and refrigeration, has caused considerable decentralization of dairying during the last fifty years.

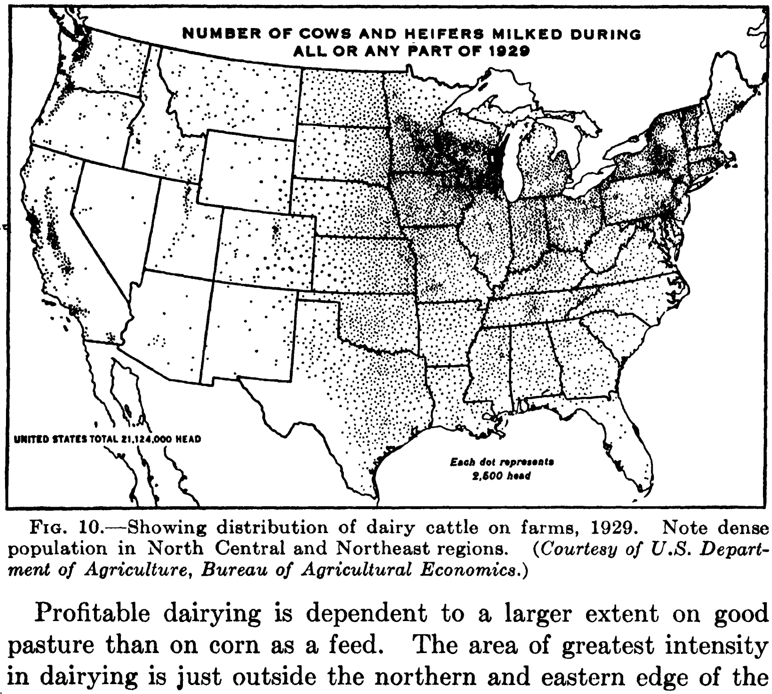

FIG. 10.—Showing distribution of dairy cattle on farms, 1929. Note dense population in North Central and Northeast regions. (*Courtesy of U.S. Department of Agriculture, Bureau of Agricultural Economics.*)

Profitable dairying is dependent to a larger extent on good pasture than on corn as a feed. The area of greatest intensity in dairying is just outside the northern and eastern edge of the most favorable corn-hog area. This is an area in which much of the land is a little too rough for easy cultivation, yet because of heavy rainfall, good soil, and moderate temperature, it is a productive grazing area and is favorable to dairy cattle. On most farms there is enough level land to produce sufficient grain, hay, and silage to supply the requirements for winter feeding.

One more factor accounting to some extent for the concentration of dairying, especially in the North Central section, notably Wisconsin and Minnesota, is the fact that this area is settled

largely by people of Scandinavian, Swiss, and German descent who have been familiar with dairy farming for many generations and who have a liking for the dairy-cattle enterprise. This factor perhaps accounts more for the heavy concentration of the cheese-making industry in the state of Wisconsin than any other influence. About 60 per cent of all the cheese made in the United States is made within the boundaries of the one state of Wisconsin.

Sheep.—Sheep production shows very largely the same concentration areas as beef cattle, for the same reasons. Sheep production, like beef production, is to a considerable extent

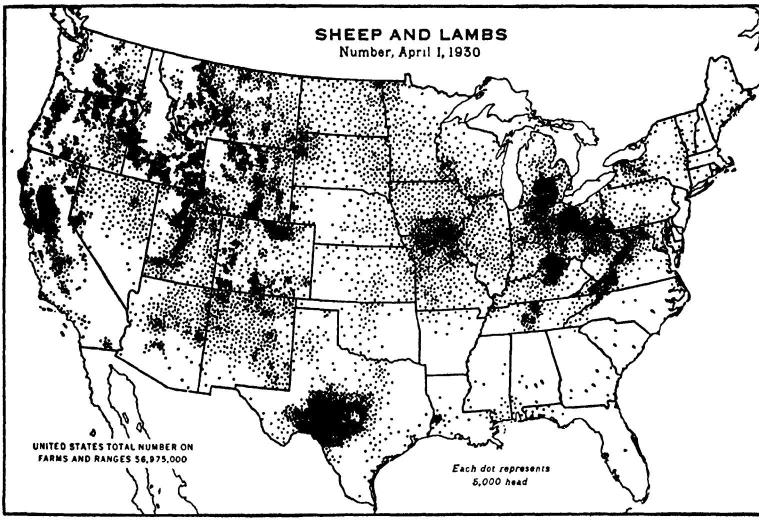

FIG. 11.—Showing distribution of sheep on farms, 1930. Note many small concentration areas scattered throughout the country. (*Courtesy of U.S. Department of Agriculture, Bureau of Agricultural Economics.*)

carried out in two stages. The lambs are grown to ages of six to eight months in the semiarid range areas, then sent to Corn Belt farms to be fattened. Many breeding flocks are also maintained in the Corn Belt, where the breeding flock of sheep is often supplementary to the hog enterprise by its utilization of coarse feeds. Since beef cattle and sheep are in direct competition with each other in both the Range and Corn Belt areas, one might ask, why doesn't one of them win out and eliminate the other? The answer is that there is a large demand for the product of each, and as soon as one starts to expand, the price for the expanding type starts to decline and begins to rise for the decreasing type. This

tends to keep them in balance. The fact that sheep do better than cattle on the less productive ranges, in the forests, and in the mountains gives them preference in such sections, whereas cattle hold preference on the better, more level range areas. Since sheep raising and lamb fattening compete directly with cattle raising and cattle fattening in the Corn Belt, the personal preference of the farmer often determines which of the two types he will produce. Occasionally, over a short period of time, there may be an economic advantage favoring sheep or favoring beef cattle for the Corn Belt farm, but any such advantage is continually swinging back and forth between the two types.

Horses and Mules.—Prior to the invention of the steam engine, the electric motor, and the gasoline engine, horses and mules were

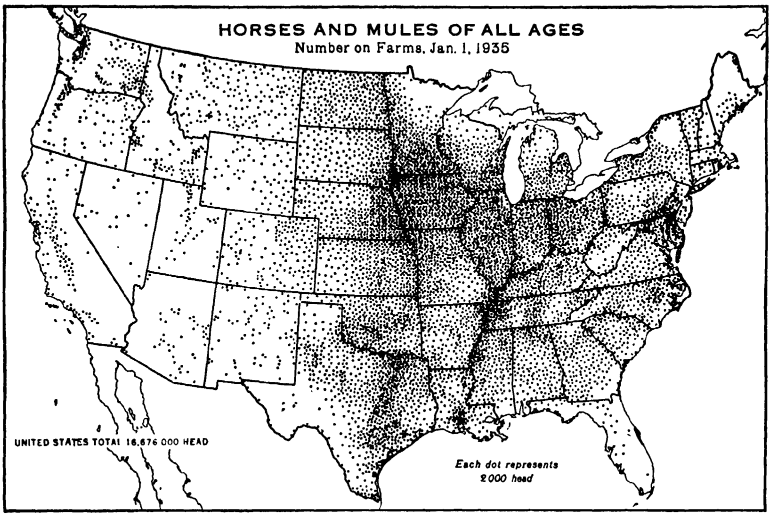

FIG. 12.—Showing distribution of horses and mules on farms, 1935. Note even distribution throughout agricultural states. (*Courtesy of U.S. Department of Agriculture, Bureau of Agricultural Economics.*)

the chief source of power for all purposes of transportation and draft. Horses and mules have always been most economically produced when the mares raising the colts could also be used to do farm work. Consequently, the production plan for horses and mules has been for each farmer to breed what mares he had, retain what colts he needed, and sell the rest. Light horses and mules have been produced in the Southern third of the country and heavier horses in the Northern two-thirds. The mule

became popular in the South because of its ability to withstand heat better than horses. The horse remained popular in the North because its larger size gave an economic advantage over the mule for the heavier work required.

Before the automobile and truck replaced horses and mules on the highways and in cities, there was a large market for the farm surplus of these animals in the cities. This led to some concentration of surplus mule production in the South and of surplus horse production in the Corn Belt. Many farmers in these regions found it profitable to specialize to some extent in horse or mule production, making the raising of colts a major enterprise on their farms. For more than a hundred years, especially since their replacement by railways, streetcars, automobiles, trucks, and tractors, the need for horses and mules has been on the decline. The point has been reached where the remaining extensive economic uses for the horse and mule seem to be for farm and ranch work. As a result of this trend, present-day horse and mule production is favorably located only when carried out on the farm or ranch where the colts will be needed for replacement of the work stock, wherever that farm or ranch may be.

Some light horses are still required for commercial use under the saddle, and mares carrying some light horse blood are preferred for mule production in the Southern states. Such mares comprise part of the work stock of the South. The breeding of the types of light horses suited to work on Southern farms and to mule production is recommended as a farm enterprise on farms located in the Southern states. The breeding of saddle horses and race horses is carried on most successfully when a number of mares can be maintained in a group, so that the service of a high-class stallion may be provided and so that a number of colts can be trained by one skilled trainer. Saddle-horse and race-horse production is, therefore, a highly specialized enterprise that should be undertaken by comparatively few persons who possess thorough knowledge of the requirements for successful production and marketing of such horses.

Poultry.—The importance of poultry and eggs in the human diet gives poultry a place as one of the forms of animal life deserving thorough consideration in selecting the kind of animal to produce. A small flock of chickens is maintained on nearly every farm to provide poultry and eggs for the family. It has

long been the custom on nearly every farm to maintain a somewhat larger flock than necessary for this purpose and to sell some eggs and some poultry. More recently many farmers have chosen to emphasize poultry production as a major enterprise, and many specialized egg-production and turkey-production ranches have been developed. Poultry is more evenly distributed throughout the country than any type of livestock, but there has been some concentration of production in the Corn Belt states, where corn forms a large part of the feed used. Small centers of intensive poultry production have developed in other parts of the country for varying causes, such as proximity to a good market, availability of suitable feeds, or favorable climatic conditions. The southern California poultry-producing area is an illustration of an area where extensive poultry production is based on proximity to a large market, combined with climatic conditions favorable to poultry production. A large percentage of the feed has to be shipped to the area from a distance. The large poultry industry in New York State is another illustration of proximity to a large market as the attractive feature, rather than low-cost feed. Poultry production is an enterprise that can be emphasized on nearly any farm. Poultry production on a large scale is, however, a highly specialized enterprise. Anyone contemplating large-scale poultry production should secure complete information covering its requirements from specialized poultry literature and specialized poultry authorities.

Fur-bearing Animals.—Although furs are commonly thought of as a product of wild-animal life, many fur-bearing animals have been domesticated, or at least placed under confinement, and successfully propagated. Many fur farms, or ranches, as they are called, have been developed during recent years. Generally they are specialized enterprises, but many farmers have taken up the production of fur-bearing animals as a farm enterprise. The fox, mink, muskrat, beaver, rabbit, and Karakul sheep are the species commonly maintained under partial or complete confinement and care. Fur farming has attracted most attention in the Northern states, though fur farms are found throughout the country.

Competition between Kinds of Livestock.—A study of the animal-population distribution maps reveals a concentration of

the production of each kind of farm animal in certain areas; it also reveals considerable overlapping of the areas, indicating that two or more kinds of animals are in competition for the use of the land in the same area. This is notably true of the Corn Belt area, where all five production types are represented. This overlapping of concentrated production areas is explained by the fact that so far as natural adaptation is concerned, some areas are equally well adapted to the production of several kinds of animals. There may be a favored type of animal, such as hogs in the Corn Belt, the production of which will be stopped by an economic cause, such as limitation of demand for pork products. When this occurs, the next most favored type of animal production is introduced. In the Corn Belt, this is the fattening of cattle or the fattening of lambs. If these second enterprises become limited by supply of feeder animals or a clogging of the market for finished animals, farmers will begin a search for still another type of enterprise that can be profitably conducted. In the Corn Belt, this might be dairying, the maintaining of a breeding herd of beef cattle, a breeding flock of sheep, poultry raising, or even the raising of horses to sell. In fact, in some sections, such as the American Corn Belt, the farmer, after all, may base his selection of a livestock enterprise largely on his personal preference. In practice it is not quite so simple as this, because careful examination of the most profitable livestock farms generally reveals one or more good reasons for their success besides the personal preference of the operator. It is not uncommon to find one farm succeeding as a cattle-feeding farm and the one next to it as a dairy farm. Examination of conditions prevailing on the two farms will generally reveal either a favorable natural factor or a favorable economic factor as the reason why one of these farms should be a cattle-feeding farm and the other a dairy farm.

Such an examination of farms will reveal many less successful farms on which the operator is unknowingly or stubbornly going against some natural or economic influence in the promotion of his chosen livestock enterprise.

Close scrutiny of the animal-distribution maps shows that for several kinds of livestock, notably sheep and dairy cattle, there are small concentration areas at different points throughout the country and a thin sprinkling of each kind of livestock production

spread rather uniformly throughout the country. There is always a good natural or a good economic reason for the success of the predominant enterprise in small concentration areas or on isolated farms. For example, the concentration of sheep production in southern Ohio is due to the hilly topography, better suited to grazing by sheep than by any other type of farm animal. The concentration of dairying in southern California is due to the large market for dairy products at high prices rather than to low-cost production.

Multiple-livestock Enterprises.—Thus far, discussion has been directed toward the selection of the most advantageous single-livestock enterprise. On many farms the net income can be increased by carrying on two or more livestock-production enterprises.

It has been found from experience that the efficient growing of crops in such a way as to secure and maintain high productivity of the soil is essential to the greatest success in livestock farming. Successful crop production requires, among other things, a rotation of crops in order that all of the compounds of plant nutrition be utilized. Some crops, such as corn and the small grains, draw most heavily on nitrogen from the soil and deplete it of humus, whereas grass and hay crops return humus, and legume crops draw heavily on mineral compounds and return nitrogen and humus. The practice of crop rotation, when carried out advantageously, results in the production of a variety of feeds, all of which generally cannot be used to best advantage by any single kind of livestock. As an example, on many farms, a good cropping system would involve the growing of some pasture, some legume hay, some oats, and considerable corn. Hogs would be first choice of livestock for this farm to utilize the corn, but hogs would not utilize the pasture, hay, straw, or cornstalks. Sheep, beef cattle, or dairy cattle should be added to utilize the pasture and coarse feed, even though they would require some of the corn and thus reduce somewhat the number of hogs that could be produced.

On farms suited primarily to dairying, where cream is marketed, hogs have a minor complementary value in that they make the best possible market for the skim milk. Thus the hogs help the dairy enterprise by making a market for the skim milk, and the dairy cattle help the hog enterprise by providing some feed

for hogs. If the farm is one on which corn production is limited, the dairy enterprise should be the major enterprise and only enough hogs kept to utilize the skim milk. If the farm is especially adapted to corn growing, hogs should be the major enterprise and only a large enough dairy herd maintained to utilize the pasture and coarse feed produced.

Besides facilitating the most effective utilization of the land and often proving complementary to each other, the production of several kinds of animals on the same farm often contributes to more effective use of labor. For example, in dairying a large amount of labor is required in caring for the cattle, milking, and handling the milk. Sheep are handled with much less labor, but they utilize the same kinds of feeds and pastures as dairy cattle. Sheep also require less equipment and less expensive shelter than dairy cattle. On farms that are especially suited to dairying but on which sufficient satisfactory barn room or labor is not available to facilitate a large enough dairy enterprise to utilize all the feed and pasture, sheep may be introduced as a means of utilizing the feed without greatly increasing the labor requirement.

The dual-purpose type of cattle are also well adapted to this type of farm, since raising the calves and converting them into beef serve the purpose of utilizing feed and conserving labor.

The foregoing are just a few examples of how the production of several kinds of livestock on the same farm may facilitate better use of the land, supplement or complement each other, and facilitate the most effective use of labor.

The multiple-enterprise method of procedure in planning livestock production, especially for Corn Belt farms, many of which permit a first choice from several kinds of animals, has the advantage of helping to maintain a balance in the production of the several major livestock products and helping to stabilize the output and price for each. Seldom do all livestock products sell at below cost of production at the same time. Diversification in livestock production is some insurance to the farmer against a period of low prices for one of the products.

It has been the object in this chapter to point out the method of procedure that must be followed in making a wise selection of livestock as a major enterprise in farm operation. Ultimate selection of one or a combination of livestock enterprises must be based on careful study of all the influences as they are likely to

apply to the individual farm. Each farm is sure to present some problems peculiar to itself. Circumstances may dictate a favored livestock enterprise or combination of enterprises on one farm and an entirely different enterprise or combination on the adjoining farm.

Questions

1. Of what importance is a liking for the type or kind of livestock being maintained?

2. State the natural conditions and the economic conditions that may influence the wise selection of a livestock-production enterprise.

3. State several natural and several economic conditions favorable to swine production in the American Corn Belt.

4. What is meant by the two different stages of beef production?

5. Under what conditions might a beef cow herd be considered favorably located on a Corn Belt farm?

6. State three developments that have brought about the location of dairy farms at a greater distance from consumer markets.

7. With what other kind of farm animal is the sheep in direct competition?

8. Under what circumstances would you consider horse or mule production most favorably located?

9. Why are chickens generally raised on nearly all farms?

10. What kinds of fur-bearing animals are commonly produced under confinement?

11. To what extent are the several kinds of farm animals in competition with each other for the use of the land in various parts of the United States?

12. State several possible advantages of multiple-livestock-production enterprises rather than the production of a single kind of livestock on each farm.

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CHAPTER VII

JUDGING LIVESTOCK

Judging livestock is the passing of judgment by observation upon the suitability of an animal or group of animals for a given purpose. Ability as a judge of animal merit is essential to the successful buying or selling of all types of farm animals. Ability as a judge is of even greater importance in the selecting of breeding animals, because type and breed characteristics must be considered as well as the immediate utility value of the animal.

Judging Proficiency Acquired from Experience.—Until recently it was the opinion of livestock dealers and producers that the one way by which skill and proficiency as a judge could be acquired was through years of experience and the acquiring of knowledge by the trial-and-error method. Until as recently as the year 1900, any employer in search of a qualified buyer or salesman would consider only applicants with many years of experience in dealing in livestock. Judges selected to officiate at livestock exhibitions were breeders who had demonstrated their ability by building a herd of animals of superior merit. Experience is still the best teacher of stock judging, and proficiency may be acquired in time by this method without instruction. It is, however, the slow, hard, and often expensive way of becoming a competent judge of animals.

The Teaching of Stock Judging.—John A. Craig, professor of animal husbandry at the University of Wisconsin, was the first college professor to suggest that a course in stock-judging practice be offered to students. His suggestion that animals be brought into a classroom and that the students be given practice in observing, handling, and evaluating them was received by his associates as "preposterous" and "ridiculous." He was, however, allowed to schedule the course and in 1892 proceeded to organize and teach the first course in stock judging ever to be offered by an agricultural college in the United States.[1] Professor Craig's

[1] Sheppерd, J. H., Judging Livestock as a Factor in Education, *Proc. Soc. Prom. Agr. Sci.*, 1920, p. 53.

pioneering in the teaching of stock judging attracted the attention of leading stockmen in Wisconsin and was the means of making many friends for himself as well as for the college of agriculture. His work soon attracted the attention of other agricultural colleges and courses in stock judging were at once introduced into their curriculums in animal husbandry. Courses of instruction and laboratory practice in stock judging now form a part of the curriculum in animal husbandry in every agricultural college on the North American continent.

In developing his first course in stock judging, Prof. Craig had to draw entirely upon his own knowledge gained from experience in visiting markets, stock farms, and livestock exhibitions. There was no textbook or precedent to follow. He knew that standards for the many uses made of the several kinds of farm animals did exist in the minds of dealers and breeders. His objective in teaching stock judging was first to collect in his own mind correct images of these standards and by his teaching transmit them to the mind of the student more quickly and accurately than the student could build them from experience alone after leaving college. In those days, agricultural-college graduates largely returned to the farm. Professor Craig knew how badly they needed ability in livestock judging to protect them from costly errors in buying and selling animals and in selecting animals for use as breeding stock.

As Prof. Craig proceeded in the teaching of stock judging, he developed as best he could word descriptions of the requirements and characteristics of animals of the various types and breeds. He collected score cards, which by that time had been prepared and published by nearly all the purebred record associations. He collected photographs of approved representative animals of the several types and breeds. Students were required to study this material to create in their minds as far as possible correct images of the ideal animal of each type or breed. Impressions of the standards in the mind of the student were then clarified by bringing before him living animals that he could study by observation and formulate decisions as to their weaknesses, their desirable characteristics, and their value or probable production ability. Errors in observations and decisions of the student, as contrasted to the observations and decisions of the instructor, were then pointed out. It can readily be seen that if instruction of this type

is to prove helpful to the student, the instructor must be a well-qualified judge. It is by this method of instruction and practice that livestock judging is still taught.

The First Textbook in Livestock Judging.—In 1901, Prof. Craig published the written descriptions, score cards, and photographs he had collected, together with instructions on methods of making observations and formulating decisions, as the first textbook to be published in the United States on the subject, "livestock judging."[1] This book was revised and reprinted many times and served as the textbook in courses in livestock judging until about 1915, when changes in type and improvement in animals rendered its descriptions and photographs less useful. Other texts have since been published devoted entirely or partly to the subject of livestock judging.

Qualifications of a Competent Livestock Judge.—In the final analysis, the passing of judgment upon the fitness of an animal for a given purpose is merely the rendering of the opinion of the person serving as judge. Judging is, therefore, an art and not a science. It is not based on actual measurements or fixed mathematical formulas. Judging will probably be continued as an art for many years to come, because the complex make-up and variability of the animal renders any attempt to base judgment on mathematical measurements or fixed formulas cumbersome, costly, and, to date, with one or two exceptions, no more accurate than judging by observation. Shakespeare said, "Beauty is bought by the eye." In many classes of livestock, it has been found that to a high degree of accuracy utility, as well as beauty, may be judged by the eye of a competent judge.

The competent livestock judge must possess three specific qualifications. First he must have a clear conception of the standard and requirements of the type and the purpose for which the animal being judged is to be used. Although this standard is an imaginary one, it exists with a high degree of uniformity in the minds of all well-trained or experienced judges. This is true because the image or standard is built from common knowledge as to the correlations between appearance and utility in animals. These correlations, in turn, have been determined in many ways by different tests, such as slaughter tests of meat

[1] Craig, John A., "Judging Livestock," 1st ed., The Kenyon Printing Company, Des Moines, Iowa, 1901.

animals, production records of milk cows, and speed records of horses.

The second qualification of the competent judge is that he be able to see quickly and accurately every minute detail in form and appearance of the animal and register in his mind the degree to which such details approach or vary from the standard. This keenness of observation is often the determining factor in the success of the individual as a judge. Obviously carelessness or inaccuracy of observation would lead to inaccuracy of judgment.

The third essential qualification of the expert livestock judge is that he possess ability to render decisions. The rendering of the decision means the balancing of weaknesses against desirable characteristics as observed and coming to a conclusion as to just how far as an entity the animal in question varies from the ideal or standard. This is the most difficult part of judging and is the point at which self-confidence is required, especially in show-ring judging, where the animals must be arranged in the order of merit, even though differences are so minor as not to justify a difference in price.

How Judging Is Used.—Judging of livestock is used for three major purposes: (1) by buyers and sellers of commercial animals in determining the proper class and grade in which an animal belongs, (2) in the selection of breeding animals, and (3) in making show-ring awards.

The Use of Judging in Buying and Selling Commercial Animals. Although on large markets commercial livestock is not officially classified and graded before it is sold, every animal that exchanges ownership on a large market or any place else is classified and graded after a fashion by both buyer and seller. Both have in their minds some sort of standard to which the animal is compared in their attempt to arrive at an equitable price for it. The market classes and grades for commercial animals have been described in Chaps. XIII, XXIV, and XXX. Since requirements of the several classes are distinct and are determined by the use to which the animal is adapted, deciding upon the class in which an animal belongs is simple and is easily accomplished. Since the grade is determined by the degree to which the animal will fulfill the requirements of its class, the grading of animals after they have been classified is not so simple, and it is at this point that the skill of the judge is required. Once the class and

grade have both been determined, it is easy to arrive at the price at which the animal should sell. Men engaged regularly in buying or selling large numbers of animals each day have in mind prices at which animals of the various classes and grades have been selling and need only apply the prevailing price for its class and grade to the animal or group of animals with which they are dealing. On a rising market the buyer may have to bid a trifle higher than the previous day's quotation in order to make a purchase, whereas on a declining market the seller may have to accept a trifle lower price than the previous day's quotation in order to make a sale.

FIG. 13.—The market-cattle buyer judges from the saddle. (*Courtesy of Swift and Company.*)

The farmer who has occasion to purchase or sell animals only now and then may protect himself against the shrewd buyer or salesman by checking a reliable market report to learn the current price at which animals of the class and grade he has to offer are selling. The market report itself is of no value to him, however, unless he is judge enough to determine in what class and grade his animals belong.

All types of commercial meat animals are commonly purchased by the pound. This eliminates the necessity of estimating weight

on the part of both buyer and seller and simplifies the judging task to some extent. In dealing on large markets, however, the weight is not taken until after the sale of the animal has been made. It is, therefore, important that a buyer or salesman be able to estimate the weight. Since the value of the carcass an animal will produce depends to some extent on its dressing percentage, the successful buyer or salesman must be able to estimate dressing percentage. Any buyer for a large company purchasing many animals each day whose estimated dressing percentage for the day's buy would regularly miss the actual dressing percentage more than one-half of 1 per cent would soon be dismissed.

Purchase of slaughter animals on the basis of their carcass weight, class, and grade has been suggested as a basis for arriving at a more equitable sale value to both buyer and seller than the present method of basing the selling price on the appearance of the live animal. In fact, in Canada and Denmark this method is used to some extent by processing plants in buying hogs. In both countries the carcass grading is done by government employees. There is little doubt that this plan is slightly more equitable than buying on the basis of the live animal. It does, however, involve more record keeping on the part of the processor, for which the producer must pay. To date, none of the agencies engaged in the meat animal industry in the United States has become sufficiently interested in trying out sale by carcass weight, class, and grade to compel processing companies to put it into practice. It may be given more attention in this country in the future.

The Use of Judging in Selecting Breeding Stock.—The second important use of livestock judging is in the selection of breeding animals. The selection of a breeding animal is a far more complicated task than the evaluation of an animal for immediate commercial use. It requires not only the passing of judgment on the merit of the animal for the commercial use it might serve but also the passing of judgment upon the extent to which it possesses the desired breed characteristics. Selecting for breeding stock of those types of animals, the usefulness of which is in the production of a product other than meat, such as eggs, milk, wool, work in the draft horse, and speed in the race horse, is further complicated because wholly reliable correlations between

visible characters and high production do not exist to a degree making possible accurate, closely drawn distinctions between animals closely resembling one another. Nevertheless, standards for breeding animals do exist, and the beginning point in the selection of all kinds of breeding animals is the appearance of the animal and the degree to which it approaches the approved requirements for the type or breed represented as based on observation.

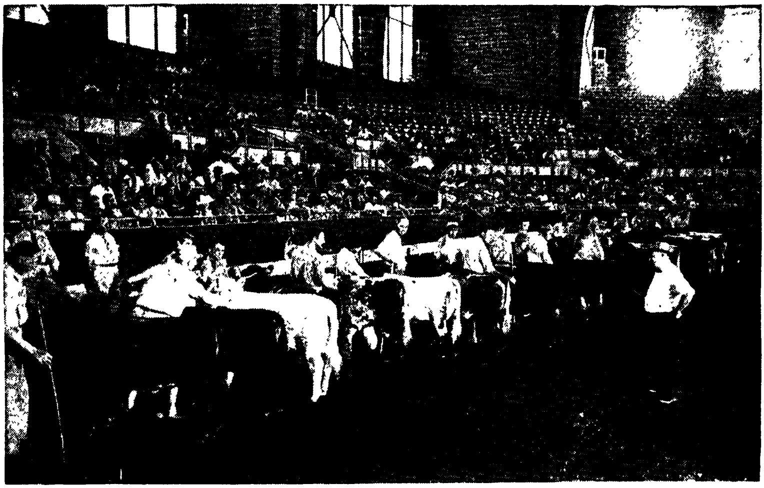

FIG. 14.—Judging the senior Shorthorn heifer calves at the Indiana State Fair, 1941. Show-ring judging requires careful study of each animal. (*Courtesy of The Shorthorn World.*)

AIDS IN THE SELECTION OF BREEDING ANIMALS.—In selecting breeding animals, the judgment of the breeder may be supplemented to advantage in several ways: (1) by ascertaining the merit of the ancestry of the animal for two or three generations back. An animal having close-up ancestors known to have been of high merit is more likely to reproduce his or her characteristics uniformly than one of about equal appearance without the strong pedigree. (2) Where consideration of a product other than meat is involved, such as egg production, milk production, or speed on the race track, production records for the animal in question as well as production records of the close-up ancestors provides a basis for estimating the producing ability or probable producing ability of progeny more accurately than it can be

estimated from the appearance of the animal. (3) Feed-consumption records may be combined with production or rate-of-gain records to indicate the efficiency of an animal in the utilization of feed. High efficiency in feed utilization, especially if it extends over several generations of ancestry, is a fairly reliable indication that the animal will transmit high efficiency in feed utilization to its offspring. (4) The final determining test of the value of a breeding animal is the merit of its progeny. When available, the progeny may supplant all other evidence as to the suitability of an animal for breeding use. Its use is limited, because many animals must be culled and discarded before they reach the reproduction age. The breeder may use the progeny test to discard animals from his herd as soon as their progeny demonstrates their failure to measure up to estimated expectation. The progeny test may also point out those animals that are reproducing in a highly satisfactory manner and lead to their retention in the herd for their full life period. The progeny test can seldom be used in a constructive way by the breeder who must purchase a new sire or additional females, because "tested and proved" breeding animals are seldom offered for sale, and, when occasionally they can be purchased, they sell at high prices.

Although the preceding methods are all helpful to supplement judgment based on observation, work and time are required to make them available. This is particularly true of the keeping of accurate feed records for individual animals. Because of the expense involved in such record keeping, performance records are available for comparatively few animals at present, though the trend is toward increased interest in them.

Judging of Livestock at Exhibitions.—It is the custom at livestock exhibitions throughout the world to have the awards made by an experienced judge by the observation method. Show-ring judging requires the rating of animals within a group in the order of their individual merit. Show-ring judging is often difficult because of the closeness with which a number of animals in a group resemble each other. However, the ratings must be made, even though based on minor differences. Detection of such minor differences, balancing them against one another and reasoning out the final comparative merit of the several animals as entities requires keenness of observation and thinking. Show-

ring judging, especially of meat animals and draft horses, is of importance because the winning animals are accepted as the nearest approach to the ideal standards that have been produced. They become the standards in the minds of less experienced judges. Owners of winning animals use such winnings extensively in advertising their herds, and buyers readily give preference to winning animals as well as their progeny in making purchases. The decisions of show-ring judges are, therefore, of far-reaching effect upon the breeding program of the entire industry. Until judging began to be taught in the agricultural colleges, only experienced breeders were used to officiate and make the awards. In more recent years, younger men with college training in judging are often invited to officiate. Instructors in the colleges are also often selected to make the awards at the larger exhibitions.

It is possible that in the future a more scientific method of evaluating animals by measurements will be developed, but to date market men and breeders alike find it necessary to base values largely on careful observation.

Questions

1. Define the phrase "livestock judging."
2. How may judging proficiency be acquired?
3. Who was the first college teacher to attempt the teaching of livestock judging? Where? When?
4. How did this teacher proceed in the teaching of judging to a class of college students?
5. Why did this teacher consider it important to teach stock judging to college students?
6. What was the first textbook on the subject of livestock judging? When was it published?
7. State the qualifications of a competent livestock judge.
8. How is livestock judging used?
9. What practices are sometimes used to aid in the judging of commercial animals?
10. What types of records or aids to the judging of breeding stock may be used to advantage?
11. Why is the judging of animals at exhibitions difficult?
12. Why are show-ring decisions important?

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SECTION II

Beef Cattle Production

CHAPTER VIII

PRODUCTS AND ADAPTATIONS OF BEEF CATTLE

The principal products of beef cattle are meat and milk. The by-products include the hide, animal feeds, fertilizer, some edible and miscellaneous by-products. Beef cattle possess wide adaptability to production on land ranging from the poorest to the richest in fertility.

Beef.—Beef, the flesh of cattle, has for about the last three centuries comprised the principal product from cattle of the beef type. It is true that beef was used as food long before three centuries ago, but in earlier times it was the by-product rather than the principal product of cattle. Steers were maintained primarily as draft animals, and cows were milked until they reached advanced age, when both were slaughtered and the flesh used as food. As cattle were replaced for work by horses and mules, they began to be slaughtered at earlier ages. This improved the taste and tenderness of the beef and created an increased demand. Prosperity of the people, particularly in the western European countries and the countries of the Western Hemisphere, because of industrial development, led to an ever-increasing demand for more and better beef. It is a long step from the tough, leatherlike beef of the worn-out work ox of three centuries ago to the savory, rich, tender beef roasts and steaks of today. Beef has established its present-day important place in the human diet by virtue of (1) its taste appeal, (2) its high nutritive value, and (3) its health-giving qualities.

Taste.—The meat of each animal species, after being subjected to heat, has a characteristic flavor. The flavor or taste of beef stands at the top of the list of all meats in its appeal to the human palate. Most persons do not tire of the taste of beef, even

though they eat it nearly every day. It is probable that taste more than any other quality accounts for the favor in which beef is so universally held as a food and for its large consumption in so many countries.

Nutritive Value.—The nutritive value of beef is high because of its high content of protein and fat, the absence of fiber, and its nearly complete digestibility. The muscle and fat tissues contain traces of minerals and vitamins, though beef cannot be considered rich in these nutrient compounds. The proteins of beef contain a wide variety of amino acids, which give it a high biological value in human nutrition. Beef, like all meats, is rather high in water content. Veal, the flesh of young calves, is highest in water content and protein and lowest in fat and connective tissue. With increasing age of the animal, the percentage of water decreases. The flesh of fat, mature, or nearly mature animals is high in fat, medium in protein, and low in water content. The beef from thin, mature, or nearly mature animals is high in protein, high in connective tissue, medium in water, and low in fat content.

Health.—The inclusion of a liberal amount of meat in the diet is known to promote health in people. Beef ranks high among all meats in this quality. The health-giving quality of beef is due not to any specific medicinal compound it contains but simply to the combined influence of its high protein content, the wide variety of amino acids it contains, its concentrated, easily digested form, and, to a lesser degree, its desirable taste.

Per Capita Consumption.—The annual per capita consumption of beef varies widely in different countries. Consumption is influenced by availability, cost, and competition from other food products, notably other meats. In the United States, the efficiency and aggressiveness of the meat-processing industry in the development of wholesale meat distribution and the existence of retail meat markets in nearly every town and village, no matter how few the inhabitants, makes beef readily available to practically every citizen of the country. The cost of beef to the consumer, however, is sometimes high, especially when compared to substitutes and, at times, when compared to other meats, notably pork. In this country, cost is more often the factor limiting consumption rather than availability, since the capacity of the country to produce beef is equal to the highest consuming

capacity that might be developed. During the last hundred years, consumption of beef in the United States has varied from a minimum of about 45 lb. to a maximum of about 70 lb. per person per year. In 1938 per capita consumption was 54 lb.[1] About 14,000,000 cattle were slaughtered to produce this beef.

Veal.—The flesh of young calves, called "veal," has a lighter color, is more tender, and has a milder flavor than beef. Veal is a by-product of the dairy industry rather than a product of the beef industry. Although calves of beef breeding produce the highest quality veal, it is not profitable to market them as veal. This is because the cost of producing the beef calf is greater than the value of the calf as veal. To be profitable, the beef calf must be grown to greater weight before being marketed. The live weight of a typical veal calf ranges from 100 to 200 lb. At what age a calf ceases to be veal and becomes beef is a question that has been the subject of much discussion. Technically, only calves fed entirely on milk until they are slaughtered should be classed as veal carcasses. Others should be called "calf carcasses." As a general rule, if a calf is not sold as veal, it is grown to a minimum weight of about 700 lb., at which point the meat will have a characteristic beef flavor, color, and texture.

Since veal is largely a by-product of the dairy industry, its production is determined by the number of cows kept for milk rather than by the demand for veal. Since veal is also a semiperishable product, the supply must be consumed rather promptly. Even so, the demand for veal is generally large enough to consume the supply at live-weight prices for the different grades of calves, averaging a trifle higher than live-weight prices for corresponding grades of beef cattle. Veal calves are somewhat more seasonal in production than beef cattle. Marketing is heavy during spring and fall months and light during summer and winter. This results in a rather wide seasonal fluctuation in price, with calves generally selling highest in summer and winter and lowest in spring and fall.

The annual per capita consumption of veal in the United States in 1938 was 8 lb. About 9,000,000 calves were slaughtered.[2]

By-products from Beef Cattle.—In the processing of cattle, the dressed-carcass weight may vary from a low of 40 to a high of

[1] *U.S. Dept. Agr. Market Statistics,* 1938.
[2] *Ibid.*

65 per cent of the live weight. The average is about 55 per cent. The remaining 45 per cent becomes by-product material. The principal by-products include the hide and hair, the digestive tract and its contents, the lungs, the blood, the liver, the heart and tongue, the head, the legs, the horns, and fat stripped from the digestive tract.

The Hide.—Of all by-product materials from cattle, the hide is by far the most important item. It represents about 7 per cent of the total weight of the animal and 10 per cent of the total value. In extremely old or extremely thin cattle, the hide may represent as much as 30 per cent of the total value, and in choice beef steers, it may represent as low as 5 per cent. This is because the hide from an old or thin animal may weigh almost as much as the hide from a choice, fat animal, and it may grade almost as high for use in manufacture into leather.

Since hides are a by-product of cattle, their production is determined by the demand for beef rather than by the demand for hides. Hides have a trade advantage in that they are a highly concentrated and nonperishable product with a broad demand. They may be stored for considerable periods of time and may be transported long distances at low cost. Since leather goods have widely distributed usage, surplus hide production in one country may be exported to other countries to find a market. Hides and leather have generally escaped high tariffs as a trade-restricting factor. As a result of the several factors favoring the marketing of hides, temporary surplus production does not depress prices so quickly or so seriously as is the case with many other animal products. The demand for hides in the United States has generally kept pace with their production. A considerable tonnage is exported annually, but imports generally exceed exports. For example, in 1938,[1] 32,603,000 lb. of cattle hides and 4,718,000 lb. of calfskins were exported, and 69,819,000 lb. of cattle hides and 11,460,000 lb. of calfskins were imported.

The Edible By-products.—The liver, heart, and tongue are the chief edible by-products and are used entirely as human food, often being used in numerous sausage products. Trimmings of beef fat are used some in oleomargarine, but its principal use is in soaps and oils.

[1] *Ibid.*

Animal Feeds, Fertilizer, and Miscellaneous By-products.—The digestive tract, lungs, blood, trimmings, and bones are utilized in tankage, meat, and bone scraps and bone meal as livestock feeds and in fertilizers. Bones, horns, and hoofs are used to make buttons, knife handles, and a number of similar products. Hair is used in plaster, brushes, and many types of padding. From some glands are made a number of pharmaceutical supplies and medicines.

Although the value of many of the by-product materials from beef cattle, other than the hide and edible by-products, amounts to only a few cents per animal, when totaled they make an appreciable contribution to the receipts the processor secures from the sale of the entire animal. Often the value of all by-products more than pays the processor's costs, so that the carcass of beef itself can be sold at a lower price per pound than the cost of the live animal.

Marked progress in improvements in the processing of cattle during the last fifty years has greatly increased the value of by-products to the advantage not only of the processing industry but also of the producer and consumer of beef.

TABLE VI.—BEEF CATTLE AND VEAL CALVES
Price per 100 Lb. Received by Farmers 1929–1938*

Year	On farms		At Chicago market	
	All beef cattle	Veal calves	Beef steers	Veal calves
1929	$9.47	$12.16	$13.43	$14.76
1930	7.71	9.68	10.95	11.51
1931	5.53	6.95	8.06	8.33
1932	4.25	4.95	6.70	6.21
1933	3.75	4.64	5.42	5.88
1934	4.13	4.92	6.76	6.10
1935	6.06	7.20	10.26	8.88
1936	5.82	7.22	8.82	9.30
1937	7.01	8.10	11.47	10.07
1938	6.56	7.86	9.39	9.00

* *U.S. Dept. Agr. Market Statistics*, 1939.

Adaptations of Beef Cattle.—The adaptation of beef-cattle production to varying conditions of climate, soil, topography, and feed supply is broad. About 75 per cent of the beef supply of the

United States is produced on farms, of the diversified or mixed-farming type on which cow herds are maintained, calves raised, and generally the calves fattened on the same farm before being marketed. This production plan has its heaviest concentration in the Corn Belt area. The remaining 25 per cent of the total production is carried on in two distinct phases. In this second production plan the calves are raised to the weaning or feeder age in large cow herds, maintained principally in the semiarid or range regions, then sold in moderate or thin condition to be fattened in other localities, principally in the Corn Belt, where feeds suited to fattening are available at low cost. The calves produced in the small herds under mixed-farming conditions are sometimes marketed as feeders; on some ranches the calves are kept until they are two and one-half years old, when they often sell as grass-fat cattle for immediate slaughter rather than as feeders.

The fattening of cattle by feeding grain or other concentrate feeds is practiced because by fattening on grain, the best quality of beef is produced, the cattle attain greater weights and dress out a higher percentage of edible beef, with the result that the process generally proves a profitable farm enterprise. It is generally good beef-cattle management to fatten the calves raised in the small cow herds at young ages on the same farm on which they are raised. It is generally good ranch-management practice to sell the calves at the calf or yearling age as feeders rather than to keep them to the two-year-old age and hope to sell as grass-fat slaughter cattle.

The fattening of calves raised on a farm or of purchased thin feeder cattle is an especially attractive enterprise to the Corn Belt farmer, because the fattening beef animal utilizes a large amount of corn in proportion to other requirements. The Corn Belt farmer is always looking for a means of marketing corn. He finds the marketing of corn by feeding it to fattening cattle to be one of the most profitable and one of the largest outlets for it.

Purebred beef cattle are usually raised in small- to medium-sized herds of 20 to 100 females. An occasional herd will number several hundred females. Purebred herds are scattered throughout the country, though a heavy concentration has developed in the Corn Belt region. Purebred beef cattle can be successfully and profitably raised under any conditions favorable to commer-

cial beef-cattle production. The breeding and marketing of purebred beef cattle as breeding stock is, however, a specialized enterprise requiring a thorough understanding of its requirements and a liking for it. The maintenance of a purebred herd should be undertaken by comparatively few men, who first make certain that they possess the necessary qualifications for success with it.

Beef from Dairy Cattle.—The total cattle population of the United States is estimated to be about 68,000,000, of which 25,000,000 are cows maintained primarily for milk production. A large part of the annual calf crop from the milk cows is marketed as veal. Many of the cows included in the census list as milk cows are either of dual-purpose or purely beef type but are listed as milk cows because they are milked and the calves raised on skim milk. Common practice is to raise calves from such cows and market them as beef. It is therefore difficult to determine accurately just what percentage of the total number of milk cows are of true dairy type or breeding. Many of the heifer calves produced in the dairy herds must be raised for replacements in the milking herds, and a smaller percentage of the bull calves must be raised for replacement of sires. As a result, comparatively few steers or heifers of dairy breeding are marketed for beef. The principal contribution of dairy cattle to the beef supply comes from culled or worn-out cows and mature bulls. They are usually thin when marketed, and what beef they provide is used largely in sausages, canned-meat products, and as dried beef.

Just what percentage of the total tonnage of the beef supply of the country is contributed by dairy cattle is difficult to estimate. It is known that they contribute nearly all the veal, and they probably contribute about 20 per cent of the beef. Since both veal and beef are by-products of the dairy industry, calves and culled cattle may be marketed at low prices and not prove disastrous to the dairy farmer. Because veal and low-grade beef are always moved promptly, regardless of price, the producer who wishes to secure top prices must avoid competition with these by-products of the dairy industry by producing only beef cattle of superior merit and efficiency.

The Crossbred Dairy-beef Calf.—In recent years a few dairymen have entered the field of beef production by mating their cows to sires of beef breeding, raising the calves, and fattening them

before marketing. Generally the object in this procedure on the part of the dairyman is to eliminate at least part of the labor of milking through a period of low prices for dairy products. When this practice is followed, a part or all of the calves are allowed to nurse and then fattened, following weaning, and marketed as baby beef.

Occasionally the object of the dairyman in introducing a beef sire is an attempt to secure a larger return from the calves by raising and marketing them as feeders or fat cattle rather than as veal. In this case the cows are milked and the calves raised on skim milk. They may then be fattened as baby beef or grown to older ages and be marketed as feeders or be fattened at the older ages before marketing.

A fair type of beef animal may be produced by either of the foregoing plans, and the practice often appears profitable for a year or two, especially if beef prices are rather high when the calves are ready for market. The most serious objection to the practice is that it endangers the maintenance of the dairy herd. In any herd of cattle, generally some culling must be done each year. It is surprising how quickly the herd will reduce in numbers if heifer calves are not being produced regularly for replacements. If a dairyman uses a beef sire for two or three years in succession before going back to a sire of dairy type, he may find it necessary to buy cows to keep up the desired number in milk or allow the herd to drop back in numbers before suitable heifers of his own raising, old enough to begin producing, will again be available. This handicap often overbalances any advantage gained by the use of the beef sire. The amount of beef produced from crossbred dairy-beef cattle is small and is of little consequence to the beef industry at present. Practice of such crossbreeding may increase but is not likely to become general, because it would interfere with the breeding of dairy cattle for high milk and butterfat production, and milk is certain to continue to be the product of primary importance from the dairy cow.

Opportunities to Increase Beef Production.—As indicated in Table VII, the two major beef-producing areas in the United States at present are the semiarid Range area and the Corn Belt. The Range area is now just about completely stocked with beef cattle and sheep. Because of competition from sheep and, to a lesser degree, competition from dry land and irrigated farming,

it is not likely that Range beef production can be profitably increased in the future. It is more likely to decrease slightly. Beef production in the Corn Belt is in competition with hogs, dairy cattle, and sheep. There is opportunity for the production of many more beef cattle in the Corn Belt area, provided a market at prices high enough to cover production cost could be developed and maintained. Between the Range and the Corn Belt, plus an appreciable supply of beef coming from scattered production through the remainder of the country, the beef market of the United States has been adequately supplied through recent years. Any marked increase in production in any part of the country can be made profitably only by increased per capita consumption at home or by developing an export market. It does not appear likely that a larger market will be obtained through either of these possibilities in the immediate future.

TABLE VII.—CATTLE AND CALVES OTHER THAN MILK COWS AND HEIFERS ON FARMS, JAN. 1, 1939*

Corn Belt region	Thousands	Range region	Thousands
Ohio	987	Oklahoma	1,462
Indiana	875	Texas	4,497
Illinois	1,565	Montana	861
Michigan	752	Idaho	553
Wisconsin	1,160	Wyoming	769
Minnesota	1,636	Colorado	1,204
Iowa	2,993	New Mexico	1,114
Missouri	1,602	Arizona	780
North Dakota	710	Utah	328
South Dakota	1,054	Nevada	339
Nebraska	2,261	Washington	449
Kansas	2,016	Oregon	730
		California	1,546
Total	17,611	Total	14,632

Total, United States	41,728,000
Total, Corn Belt region	17,611,000
Total, Range region	14,632,000
Total, all other states	9,485,000

* Estimated. Calculated from *U.S. Dept. Agr. Market Statistics*, 1939.

Possible Sources of Future Competition.—Although the United States may boast an enormous beef industry at present, involving the consumption of 7,026,000,000 lb. of beef in 1938, producers

can hardly hope for any appreciable permanent, profitable expansion of production in the future except as increasing population and possible small increase of per capita consumption may provide a slight increase in demand. Established beef producers of the Range and Corn Belt, the two great producing areas in the past, may expect possible increased competition from three sources: (1) competition for the use of the land from hogs, dairy cattle, and sheep in the Corn Belt and from sheep on the range; (2) competition from other areas possessing opportunities for cheaper production, notably the Southern and Eastern states; and (3) competition from imported beef.

Competition for the Use of the Land.—It is probable that competition for the use of the land in the Corn Belt is now fairly well adjusted among the several classes of farm animals, but it must be remembered that hogs will probably always have first claim on the corn crop until the pork market is supplied. An increased demand for dairy products, poultry products, and for lamb and wool may place the classes of animals producing these products in positions of greater economic advantage than beef cattle for Corn Belt production. Government subsidy programs to encourage increased grass and legume acreages may help to place dairy cattle and sheep in positions of economic advantage over beef cattle. The probability of future competition damaging to beef producers of the Corn Belt from other types of animals is not so likely as is competition from other areas and imports.

Competition from Other Areas.—Declining land values in many areas in the Eastern and Southern states, the westward shift of dairying from the Eastern states, and the attempt to reduce cotton and tobacco growing in the Southern states have led to the suggestion of beef production as a possible profitable enterprise for these areas. Some farmers have already established new beef herds in both the areas and appear to be succeeding in the production of baby beef and in the production of feeder cattle. The Southern states, now known as the "Old South," once comprised the leading cattle-producing section of the country. That was before the invention of the cotton gin. With their heavy annual rainfall of about 40 in. and their year-round grazing climate, they may again become an important beef-producing area.

Competition from Imported Beef.—Nearly all countries of the Western Hemisphere produce beef for export. Several have capacity greatly to increase production, provided an outlet for the beef can be found. Both Canada and Mexico export some beef cattle and dressed beef to the United States each year, even over a rather high protective tariff wall. Argentina, Brazil, Uruguay, and Paraguay each produce beef for export and would be exporting beef to the United States in large amounts were it not for the embargo against the importation of fresh beef from these countries because of the presence of foot-and-mouth disease among their cattle. Australia, New Zealand, and South Africa are additional countries possessing capacity to increase beef production greatly but because of the length of the ocean freight haul are not so likely to become competitors of the American beef producer as are the South American countries, Mexico, and Canada.

TABLE VIII.—EXPORTS AND IMPORTS OF CATTLE AND BEEF, 1890–1938
Decennial Years Only*

Year ending June 30	Exports		Imports	
	Live cattle, 1,000 head	Dressed beef, 1,000 lb.	Live cattle, 1,000 head	Dressed beef, 1,000 lb.
1890	395	353,483	31	160
1900	397	434,258	181	337
1910	139	127,406	196	949
1920	83	217,078	575	43,871
1930	8	17,232	419	120,959
1938	3	12,071	440	89,759

* *U.S. Dept. Agr. Market Statistics*, 1939.

Imports of beef and beef cattle now constitute about four per cent[1] of the total United States supply. Because so many of the near-by beef-exporting countries produce beef at lower cost than do producers in the United States, the amount of beef that may be imported in the immediate future will depend to a large extent upon the tariff, quota, and embargo legislation enacted by the United States government. Elimination of all the preceding restrictions will probably result in a large increase in beef imports, and maintenance of such restrictions

[1] *U.S. Dept. Agr. Market Statistics*, 1938.

as now prevail will limit imports to a comparatively small amount.

Questions

1. Name the principal products and by-products of beef cattle.
2. What qualities of beef are responsible for its value as a food?
3. What is the approximate per capita annual consumption of beef and veal in the United States?
4. What is the difference between a veal and a calf carcass?
5. What percentage of the value of the beef animal when slaughtered is accounted for by the hide?
6. State the several production plans commonly followed in adapting beef cattle to production in the United States.
7. What important contributions are made by dairy cattle to the meat supply of the United States?
8. What factors are likely to influence opportunities to increase profitable beef production in the United States?
9. State the possible sources of increased future competition for present-day beef-cattle growers in the United States.

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CHAPTER IX

BREEDING BEEF CATTLE

All domesticated cattle of Europe and America are thought to be descended from the *Bosaurus typicus* species of the Taurine group, genus *Bos*, family Bovidae. This species was native to central Europe. The species *Bosaurus indicus* belonging to the Taurine group differs from the cattle in Europe and America in having large drooping ears and a hump on the back. This species was native to Asia and Africa.[1] Cattle of this species are immune to the cattle tick and consequently to splenetic fever. In recent years a few cattle of this species have been brought to the United States, where they have been crossed with the native stock of the Southern states to produce immunity to splenetic fever and ability to withstand hot weather.

Since the cattle tick and splenetic fever have been practically eliminated from the United States, it is doubtful that cattle of the *Bosaurus indicus* species will become established in this country because they are inferior in both milk and beef production to established breeds of the European or *Bosaurus typicus* species.

Origin of Types.—Early in the progress of cattle improvement in Europe it became apparent that the production of a large amount of milk was antagonistic to the development of thickly fleshed beef form. As cattle were selected toward a thick-fleshed form, milk production of the cows declined. As cows of large milk production were retained in breeding herds, the beef form of the progeny began to decline. This led men in localities where milk was of greatest commercial importance to select for high milk production even at the expense of desirable beef form. Likewise, in localities where high-quality beef was of greatest commercial significance, cattle breeders selected for improvement in beef form at the expense of declining milk production in the

[1] Morse, E. W., "The Ancestry of Domesticated Cattle," *U.S. Dept. Agr. B.A.I. Sep. Twenty-seventh Ann. Rept.*, 1910.

cows. *The result was the establishment of two rather distinct types of cattle—the one now recognized as the dairy type, the other as the beef type.*

Whereas several breeds of dairy cattle and several of beef cattle have been developed in different localities, each with one or more characteristics peculiar to the breed, in general, the type of cow that will produce a large amount of milk is the same in all parts of the world. Likewise, the type of animal that will produce a desirable beef carcass in one part of the world is identical with the type that will produce a good beef carcass in any other part of the world. There are, therefore, only one approved dairy type and one approved beef type covering all cattle. Cattle of the dairy type differ from those of the beef type in that from calfhood to maturity they display a lean, angular form, whereas those of the beef type show a thick, plump form, partly because of their thicker covering of muscle and partly because of the presence of fat interspersed through the muscle tissue. There are also some slight differences in skeletal proportions between cattle of dairy type and those of beef type.

From the earliest attempts on the part of cattle producers to select either toward increased milk production or improvement in beef form, there has been a group of breeders who have chosen to follow the middle-of-the-road course and select toward a balance of medium milk production and medium beefiness of form. By this method of selection, a third cattle type, recognized as the dual-purpose or the milk-and-beef type, has been established. The imaginative ideal for this type exists clearly in the minds of the leading breeders of dual-purpose cattle. A goodly number of cattle of near-ideal dual-purpose type have been produced, but in general, since two important qualifications must be met by cattle of this type, there is less uniformity among them than has been secured in cattle of the single-purpose dairy type or in cattle of the single-purpose beef type, where only one important qualification must be met.

Beef Type.—The word "type," as applied to livestock, implies an ideal or standard created by a combination of characteristics indicating a special use for an animal. An animal of beef type must appear deep and wide in body, short in legs, short in neck, short and broad in head, and thickly covered with muscle over the shoulders, back, ribs, loin, and through the rear quarters.

When fat, the animal presents a thick-fleshed symmetrical appearance. Type in animals has changed as improvement has been made. Type changes have been brought about by directing selection toward greater efficiency for some specific use. While cattle were being used primarily for the work of drawing heavy loads and field implements, it was logical that selection be directed toward large size, strong, heavy frames, long legs, and medium flesh covering, since this type of oxen would prove most efficient for drawing heavy loads. When beef came to be a more important product of cattle than work, selection was for many years directed toward a thicker covering of flesh on the large, coarse type of animal then existing. Such large animals continued popular for many years, because they possessed certain advantages in rustling for their feed and for traveling long distances to market. It was not until improved methods of growing and feeding more suitable feeds and the development of modern railway transportation simplified getting cattle to market that it became profitable for cattle raisers to select for greater refinement and earlier maturity in beef type. Recently consumer demand for cuts of tender beef from small carcasses has also encouraged selection for greater refinement, thicker muscling, and earlier maturity, even at the expense of size. At present the characteristics indicating correct beef type are a deep, wide, thickly fleshed, compact-appearing body, uniform width and depth, straight top and underline, a small head, short neck, and short legs. This type of animal has been found to be better adapted to the production of high-quality beef than animals diverging from it.

THE PURE BREEDS

The first step of lasting consequence in the improvement of cattle for beef production through breeding was the formation of the pure breeds. In a general way, how all pure breeds of livestock were formed was explained in Chap. II. There are many breeds of beef cattle scattered throughout the world, all showing much the same general type but each possessing one or more characteristics, such as color marking, head character, or some minor detail of form, distinguishing it from all other breeds. Of all breeds recognized as of beef type, only three have attained prominence and importance in the United States—the Shorthorn, the Hereford, and the Aberdeen Angus.

The Shorthorn Breed.—The Shorthorn breed of cattle is unique among all breeds of livestock in America in that it embodies cattle of three distinct strains of breeding, the one commonly called the "Shorthorn," a single-purpose beef strain; the second called the "Milking Shorthorn," a dual-purpose strain; and the third called the "Polled Shorthorn," differing in appearance from the beef strain only in that the cattle are naturally polled.

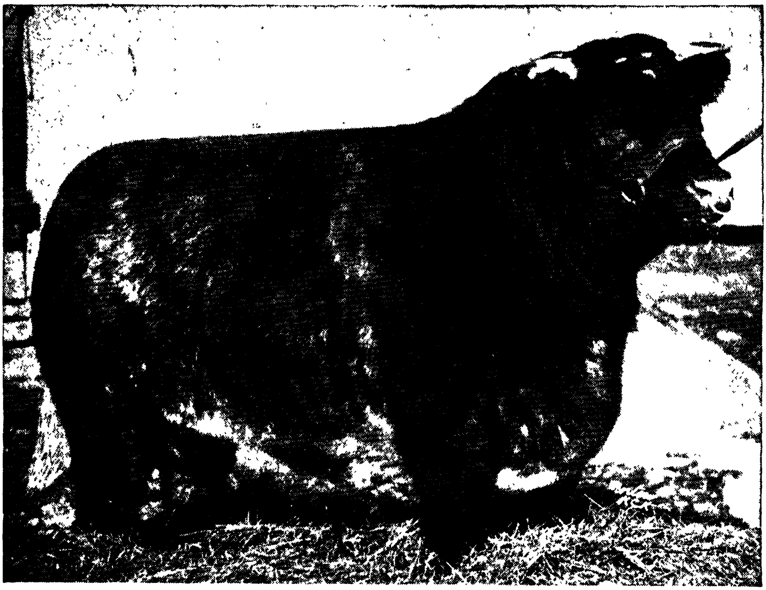

FIG. 15.—The Shorthorn bull Supreme Goldfinder. Exemplifies the modern Shorthorn of beef type. (*Courtesy of American Shorthorn Breeders' Association.*)

All Shorthorn cattle are classed together as one breed, because all are descended from the same foundation stock that was the native cattle existing in the valley of the Tees River and surrounding areas in northeast England. All Shorthorn cattle can be traced through the American and British herdbooks to foundation animals that lived in and around the Tees valley from 1800 to 1830. Back of these foundation animals is a mixed stock of cattle that possessed the characteristics of large size, rather thick, rough, coarse flesh, fair milk production, and the red, white, and roan colors that are still characteristic of the Shorthorn breed. The early cattle of northeast England were of the *Bosaurus*

typicus species and had undoubtedly found their way to England from the European continent at a much earlier date.[1]

Early breeders of Shorthorn cattle in England selected principally for cattle that would be classed today as dual purpose in type, though a few aimed toward beef production only, with little or no regard for the amount of milk produced by the cows. Charles and Robert Colling and Thomas Bates were leaders among the early English breeders of Milking Shorthorns, and Thomas Booth and his sons Richard and John were leaders among the group of breeders who emphasized beef form.

FIG. 16.—The Milking Shorthorn cow Wachess. True to dual-purpose type. Produced 2,0618.5 lb. of milk containing 775.25 lb. of butterfat in 365 days. (*Courtesy of American Shorthorn Breeders' Association.*)

The Beef-type Shorthorn.—It remained for Amos Cruickshank, of Scotland, to perfect the beef type of Shorthorn, which he did by going to England and purchasing the widest, deepest bodied, thickest fleshed, shortest legged cattle of the Shorthorn breed he could find. He then selected for improvement of this type. Cruickshank began breeding Shorthorn cattle in 1837 and by 1870 had developed a herd of 300 head. By this time his cattle were being purchased for export to many foreign countries. Other

[1] SANDERS, ALVIN H., "Shorthorn Cattle," The Sanders Publishing Company, Chicago, 1918.

breeders in Scotland followed the example of Cruickshank; many purchased cattle from him; and soon Scotland came to be known as the home of Shorthorn cattle of beef type; most English breeders continued to produce Shorthorns of the milking or dual-purpose type, and England came to be known as the home of Shorthorns of the milking type.

The Milking Shorthorn.—By continual selection toward refinement of bone, thinner skins, shorter legs, deeper bodies, smoother flesh covering, and moderate milk production through the period of about 150 years since the cattle of the Tees valley in England were first recognized as a breed, the Milking Shorthorn has been developed to the point of recognition as the leading breed of dual-purpose cattle in the world. Representative animals of the breed have been exported from England to many countries.

Shorthorns in America.—The Shorthorn was the first of the three beef breeds to attract the attention of American farmers. Importations were made early in the nineteenth century. The first imported Shorthorns were of the Milking Shorthorn type. Importations of this type to found or improve herds in the United States and Canada have continued to the present time although comparatively few have been brought over since 1920. Milking Shorthorns have a wide distribution throughout the United States, with two important centers of production. Eastern Ohio, Pennsylvania, and New York comprise one such center, and Iowa and Minnesota comprise the other.

Shorthorns of beef type were first brought to the United States from Scotland about 1870. They soon met with great favor from Corn Belt farmers who at that time were interested far more in beef production than in dairying. Bulls of the beef type were in demand for use as sires in the herds of milking type. This led to the conversion of many Shorthorn herds in America from the milking type to the beef type by the continued use of sires of beef-type breeding. The beef type of Shorthorn has continued to develop and hold greater popular favor in the United States than the milking type. Where in the early history of the breed in the United States the milking type only was to be found, a transition has taken place so that now the great majority of Shorthorn cattle in the country are of beef type. In many herds the original stock of English ancestry has been replaced by the purchase of females as well as sires of Scotch ancestry. Importations of

Shorthorns from Scotland have continued to the present time, and many thousands of cattle of this type have been brought over since the year 1870.

The Polled Shorthorn.—A naturally polled strain of Shorthorn cattle has been developed in the United States within the Shorthorn breed by the use of several natural polled cows that appeared as mutants in purebred horned herds. Mated to purebred bulls even though horned, these cows produced some heifer calves and some bull calves that were naturally polled. When mated to a

FIG. 17.—The Polled Shorthorn heifer Queen of Hearts. A winner of many championships in Polled Shorthorn exhibitions. (*Courtesy of American Shorthorn Breeders' Association.*)

naturally polled bull, the polled cows produced a high percentage of polled calves. Learning of these naturally polled purebred Shorthorn cattle, several breeders purchased them and began to develop herds that would breed true for the polled characteristic. The number of polled Shorthorns has steadily increased since the origin of the strain about 1880. Breeders have accepted the same standard as that for beef Shorthorns, with the polled character the only distinguishing characteristic for this third section of the Shorthorn breed. Shorthorn cattle of the three strains are registered by the one record association, the American Shorthorn Breeders' Association, with offices in Chicago. The

pedigrees issued are labeled to indicate to which section of the breed the animal represented by the pedigree belongs. When an animal with horns appears in a polled herd, it is registered as a beef-type horned Shorthorn. The total number of purebred Shorthorn cattle, including the three sections of the breed, recorded in the United States since the introduction of the breed to this country passed the 2,750,000 mark during 1941. Shorthorn cattle are now widely distributed throughout the United States. The office of the American Shorthorn Breeders' Association is in Chicago, Ill.

The Hereford Breed.—During the period from about 1750 to 1800, while farmers of northeast England were producing the Shorthorn breed, farmers of Herefordshire in west central England were establishing another breed of beef cattle destined to vie with the Shorthorn for efficiency in beef production throughout the world. The native cattle of Herefordshire from which the Hereford breed was developed were, like the ancestors of the Shorthorns, large, coarse, and moderately thick in flesh covering. They possessed large, coarse, spreading horns and a color pattern that was red with some mottling of white; generally they had white faces and legs. First attempts at improvement through selection, just as with the Shorthorns, were directed toward thicker flesh covering and fixing of the characteristic color markings. Among early improvers of the breed may be mentioned Benjamin Thompkins, his son Benjamin Thompkins, Jr., John Price, William and John Hewer, John Haywood, J. K. Arkwright, and William Tudge. The outstanding characteristic of early purebred Hereford cattle that attracted world-wide attention was their ability to thrive and fatten on grass. This characteristic was probably acquired through many years of maintenance in the typical grazing area of their native Herefordshire. Ability to graze has remained a characteristic of the breed throughout the years and is the quality more than any other responsible for the popularity of Hereford cattle wherever subsistence depends mainly on grazing. In later years, selection, just as in the beef Shorthorn, has been toward wide, deep bodies, a thick, smooth flesh covering, refinement of bone, horns, and skin, short legs, a short neck, and a small neat head with adherence to the white face, white underline, white legs, and a white switch as the characteristic color

markings. Size has been reduced and earlier maturity secured by this procedure.[1]

Herefords in the United States.—The first Hereford cattle were brought to the United States early in the nineteenth century, but importing did not become extensive until as late as 1880. During the decade of the eighties, many hundreds were imported, and the breed soon acquired wide distribution throughout the country. The Hereford breed met with favor in the Corn Belt,

FIG. 18.—The Hereford bull Beau Beauty. Winner of many show-ring awards. A model Hereford in modern type. (*Photograph by Smith.*)

where grade calves sired by Hereford bulls showed aptitude to fatten quickly on corn. The breed met with still greater favor when introduced into the vast semiarid grazing area of the South and West. There calves from the native cows sired by Hereford bulls showed great improvement in beef form and retained ability to thrive and fatten on the sparse grasslands of the area. Since cattle ranching was making its most rapid growth just at the time when extensive importations of Herefords were

[1] SANDERS, ALVIN H., "The Story of the Herefords," The Sanders Publishing Company, Chicago, 1914.

being made, there developed an incessant demand that continued until Herefords now rule supreme as about the only beef breed to be found throughout the cattle-ranching area of the country. Grade Hereford steers and heifers grown on the range are in popular favor with Corn Belt cattle fatteners. The office of the American Hereford Breeders' Association is in Kansas City, Mo.

FIG. 19.—The Polled Hereford heifer Olga Domino. Grand champion National Polled Hereford Show, 1940. (*Photograph by Smith.*)

The Polled Hereford.—The Hereford breed, like the Shorthorn, has a polled section or strain, with the polled character as the only characteristic distinguishing it from the horned type. In 1901, Warren Gammon and his son B. O. Gammon, of Des Moines, Iowa, collected what naturally polled purebred Hereford cattle they could locate in herds of purebred horned cattle and began to breed Herefords of the polled characteristic. A year or two later, the Gammons organized the American Polled Hereford Breeders' Association. Warren Gammon was elected the first secretary. Polled Herefords are now registered by the American Polled Hereford Breeders' Association, Des Moines.

Because of the somewhat cumbersome awkward horns of horned Hereford cattle, the Polled strain met with ready approval

on the part of many farmers, ranchers, and breeders who liked all other characteristics of the breed except the horns. The number of Polled Herefords has been increased about as rapidly as possible since the origin of the strain but is still small compared to the number of horned Herefords. An ideal Polled Hereford should possess the same characteristic as an ideal horned Hereford minus the horns. There have been nearly 3,000,000 purebred Hereford cattle registered in the United States since the introduction of the breed. Herefords are found in greatest

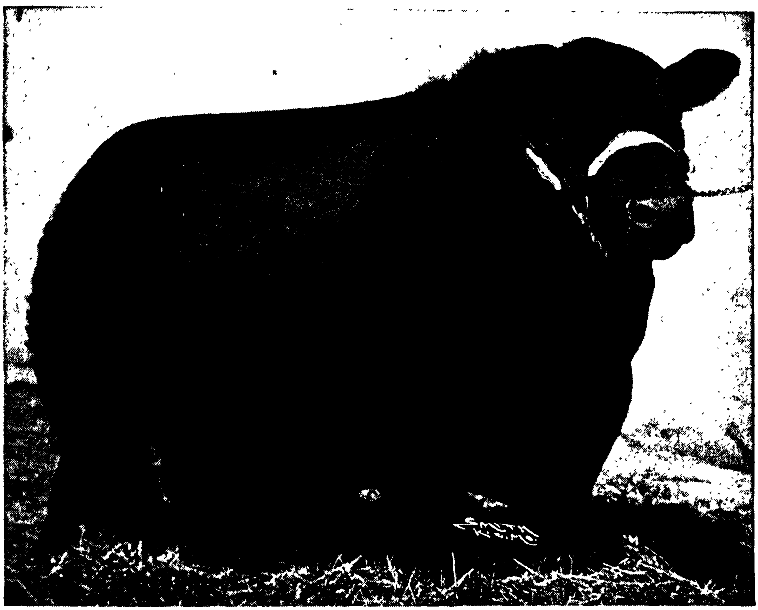

FIG. 20.—The Aberdeen Angus bull Elgon Sunbeam. Near ideal in type and a noted sire. (*Photograph by Smith.*)

numbers through the range area of the South and West, with a considerable number of grade and purebred herds throughout the Corn Belt.

The Aberdeen Angus Breed.—The Aberdeen Angus breed of cattle was developed in northeast Scotland during the period 1800–1850. Hugh Watson and William McCombie were the two leading early improvers of the breed. The native cattle from which this breed was formed were naturally polled, black in color, and somewhat smaller, more refined, and smoother

fleshed than the progenitors of the Hereford and the Shorthorn. From the time of Watson and McCombie, Angus breeders have selected toward the one objective of quality beef, efficiently produced. The solid black color and polled-head character, together with the single-purpose standard, have simplified problems of inheritance and made possible the attainment of the highest degree of uniformity to be found in any breed of cattle. As a result, the Angus has come to be known as the breed par excellence for the production of quality beef.[1]

The ideal type calls for an animal that is wide, deep, and compact in form, thick and smooth in muscle covering, with short legs, a short neck, small neat head, without horns, and solid black in color.

Aberdeen Angus in America.—Like the Herefords, few Aberdeen Angus cattle were imported to America until 1880. From 1880 to 1890 many were brought over from their native home in Scotland. The breed met with greatest favor in the Corn Belt, where grade calves sired by Aberdeen Angus bulls produced high-quality beef. There have been about 650,000 purebred Angus cattle registered since the breed was first introduced into the United States. They are found chiefly in the Corn Belt and the Eastern and Southern states. The office of the American Aberdeen Angus Breeders' Association is in Chicago.

The Red Polled Breed.—Red Polled cattle are mentioned here because with the Milking Shorthorn they constitute the two breeds of dual-purpose cattle of importance in the United States. Since beef is an important product from cattle of dual-purpose type, they have a place in any discussion of beef production. The Red Polled breed was produced in eastern England by the intermingling of two types of cattle existing in this locality toward the end of the eighteenth century. One type was small, compactly built, thick-fleshed, fine-boned, and horned; the other was larger, coarse-boned, thin-fleshed, and polled. This type was given to moderate milk production. Both types were red in color. A number of years of selection resulted in a solid red, polled type, medium in quality of skin and bone, medium in length of leg. The cows produced a moderate amount of milk. John Reeves, Richard England, Benjamin Pond, and Nicholas

[1] SANDERS, ALVIN HOWARD, "A History of Aberdeen Angus Cattle," The Breeders Gazette, Chicago, 1928.

Powell were the early improvers of the breed. They were actively engaged in raising cattle during the period 1800–1850.

Red Polled Cattle in America.—Red Polled cattle were first imported to the United States in appreciable numbers during the decade 1880–1890. They met with favor from farmers who like a type of cattle having cows that can be profitably milked and the calves raised for beef, thus utilizing labor, pasture, hay, and grain in balanced proportions and securing both butterfat and beef calves from the cow herd.

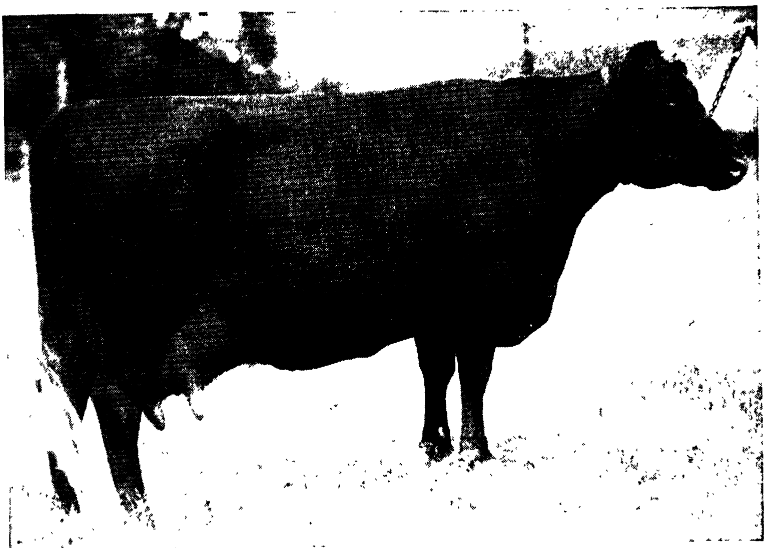

FIG. 21.—The Red Polled cow R. L. Kitty. Produced 14,113.5 lb. of milk containing 622.25 lb. of butterfat in 365 days. (*Photograph by Strohmeyer.*)

Red Polled cattle have a general but sparse distribution throughout the mixed farming areas of the country, with their heaviest concentration in the North Central dairy states of Minnesota, Wisconsin, and Michigan. There have been about 150,000 purebred cattle registered by the Red Polled Cattle Club of America, whose address is Lincoln, Neb.

METHODS OF BREEDING BEEF CATTLE

Breeding Purebreds.—Although purebred cattle of beef type have never comprised more than 2.5 per cent of all cattle maintained for beef production in the United States, this 2.5 per cent is of great significance, because whatever improvement in beef

quality or efficiency of production has been produced in the general cattle stock of the country during the last hundred years has been secured through the pure breeds. Since the formation of the pure breeds and their introduction into the United States, the general breeding plan has been the maintenance of a comparatively few purebred herds, rather widely scattered throughout the country, these herds supplying sires that have been purchased by producers of commercial cattle and mated to whatever kind of cows might be available. Efforts to produce further improvement through application of improved breeding principles have been practically limited to the purebred herds, producers of commercial cattle being content to buy and use the bulls as they found them in the purebred herds.

Breeders of purebred beef cattle have made marked progress in improving fleshing quality, increasing efficiency of feed utilization, perfecting type, securing early maturity, and developing greater uniformity. Much of this improvement has been passed on to the commercial cattle through the use of the purebred sires. Breeders of purebreds have practiced selection toward a well-defined standard type, as judged by appearance of the animal. They have based selection to some extent on the merit of the ancestry of an animal and, where possible, on the merit of progeny. They have in some instances hastened the fixing of characters more quickly by mating related animals. Perhaps of greatest importance in the improvement of purebred beef cattle has been the guarding of the purity of the breeds by the registering of animals and preventing the introduction of animals carrying wide variations from the standard type.

Throughout the history of purebred beef cattle in the United States, the demand for purebred females with which to start new herds and the demand for bulls for use in commercial herds has been large enough to maintain a market for them at prices above their immediate commercial value. At times prices for the better animals have reached several times their commercial value, and occasionally animals have sold for many times their commercial value. This opportunity for the successful breeder of purebreds to secure a larger profit on each animal raised is the attractive feature of breeding purebreds rather than commercial cattle. The breeding of purebreds, however, requires a special liking and aptitude for the work, requires attention to details of care, the

keeping of the necessary records for registering progeny, and, above all, looking after advertising the herd and the selling of the produce to the best possible advantage. Only those men who enjoy meeting these special requirements of purebred beef cattle production should engage in it. Others are not likely to succeed as constructive breeders or from the financial standpoint.

Grading Up.—As stated above, since the development of the pure breeds of beef cattle, the common plan of breeding commercial beef cattle has been to mate a purebred bull of one of the beef breeds to whatever cows were available. When the first purebred bull is followed by purebred bulls of the same breed, the breeding plan is known as "grading up." By this method a herd of common cows of nondescript breeding may be converted into a herd showing uniformly the characteristics of the breed from which the bulls were chosen in four to five generations. Marked improvement in beef form will also be secured with each succeeding generation up to about five generations if reasonable judgment and care are exercised in the selection of the herd bulls. It was by this method of breeding that the cattle stock of the entire Range area was converted from the miscellaneous, nondescript conglomeration of cattle prevailing throughout the area from 1850 to 1890 to the uniform, high-grade Hereford characteristics of the cattle population of this area at the present time.

Crossbreeding.—Although crossing of the breeds has had an important place in the production of hogs and sheep for market, it has been used little in the production of commercial cattle. Purebred females have been too costly to use for crossbreeding, because the progeny then cannot be registered and loses its identity. A few producers who have crossed females resulting from four or five generations of grading up with a bull of another breed like the practice for one cross, returning then to bulls of the original breed. This outcross, as it is called, seems to give a stimulus to the vitality and growth rate of the resulting calf crop.

Beef-cattle Breeding in the Future.—The success of the methods by which such marked improvement of beef cattle through breeding has been secured in the past suggests a continuation of those methods as the most likely to succeed in the future. Recent knowledge concerning the mechanism of inheritance suggests, however, that new practices enabling more complete control of the factors determining the development of

valuable characters in animals may soon be forthcoming. Beef-cattle breeders should be alert and quick to adopt such new methods and practices if and when they may be demonstrated to be of practical and profitable application in the cattle-breeding program.

Questions

1. Give the species, group, genus, and family classification of the domestic cattle of Europe and America.
2. Define type as used in referring to animals.
3. How do types originate?
4. How does a breed of livestock differ from a type?
5. How do breeds originate?
6. Name the three branches of the Shorthorn breed, and state the distinguishing characteristics of each.
7. In what parts of the United States are most of the purebred Shorthorn cattle located?
8. What are the outstanding adaptations of the Hereford breed?
9. How did the Polled Hereford originate?
10. Where was the native home of each of the three breeds of beef cattle?
11. State the outstanding characteristics and adaptations of cattle of the Aberdeen Angus breed.
12. What are the principal characteristics and adaptations of Red Polled cattle?
13. State and explain the several methods that are followed in the breeding of beef cattle.

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CHAPTER X

FEEDING BEEF CATTLE

The feed supply is the largest item of cost in beef production. It is therefore of utmost importance that feed costs be kept at the lowest possible level if beef production is to be profitable. Keeping feed cost low does not mean feeding the cattle on the poorest feed or the smallest amount of feed that will keep them alive but rather keeping feed costs low in proportion to the amount and quality of beef produced. Often the feed cost of producing gains can be reduced by improving the quality of the ration, thereby obtaining more rapid gains and improved quality of beef, even though the cost of feed per day may be increased.

Grass the Most Important Feed for Beef Cattle.—Beef production is based on grass as the principal item of feed to a greater extent than is the case with any other kind of farm animal except sheep. Several reasons may be cited to explain this close relation between beef cattle and grass. (1) Grass is a sufficiently well-balanced feed so that it supplies all nutrients needed for health and thrift in the maintenance of mature beef cattle as well as young growing cattle. (2) The large capacity and the ruminant type of digestive system in cattle make it possible for them to eat and digest large quantities of grass. (3) The slow growth and low nutrient requirement of beef cattle make it possible for them to secure enough nutriment from grass to promote normal production. (4) Because of the slow rate of growth of young beef calves and the low milk production of cows, beef cattle are admirably suited to traveling over pasture fields and grazing for their livelihood. Throughout the grazing season in any locality, grass is generally the cheapest feed that can be provided.

Natural Grazing Lands.—The beginning point in successful beef-cattle feeding, then, is the providing of good pasturage through the longest possible grazing season each year. On lands that cannot be plowed or lands that are not suited to cultivation various types of grasses have established themselves.

The blue grama grass of the Western prairies and the bluegrass pastures of the Corn Belt and Eastern states are examples of natural pasture grasses especially suited to grazing. In regions where little or none of the land can be plowed, such natural permanent pastures must provide the only feed throughout the grazing season. Pasture management in such areas involves little more than regulating the number of cattle to the carrying capacity of the area. Such natural pasture grasses make a rapid growth during the early months of the growing season, then generally stand dormant during the hot, dry months characteristic of nearly every part of the world during the midsummer season. To be pastured profitably, they must be undergrazed during the period of lush growth, and the cattle must then graze the surplus mature growth during the dry spell. Gains on permanent pastures are always most rapid during the early part of the grazing season, when the grass is tender, green, and low in fiber content. Cattle will continue to gain, though more slowly, after the grass has matured, provided there is a surplus growth for them to eat. Gains on pasture are lowest toward the close of the grazing season, but a change takes place in the tissues of cattle during this period. The water content decreases, and the tissues harden, thus greatly improving the firmness and quality of the meat if cattle are to be slaughtered off the grass.

The length of the normal grazing season in the United States varies from practically the full year in the extreme south to about 6 months in the northern tier of states. Acreage of natural permanent pasture land required to maintain the average mature cow through the grazing season varies widely, because of many influences, such as the character of the soil, the amount of rainfall, the length of the grazing season, the size of the cattle, and the management or control of grazing that is practiced. The extreme range is from about 1 acre per cow on the best bluegrass pastures of the Corn Belt to 70 acres per cow on the poorest pastures of the desert area of the Southwest. Likewise, the gain on growing animals per season varies, with a minimum of 200 lb. through the short grazing season of the North to about 400 lb. during the longer grazing seasons on the better pastures of the South.

A constant supply of salt kept near the watering place and a constant supply of water always available are two essentials to

the best gains from beef cattle on pasture. Alternate or rotation grazing and sometimes deferred grazing to promote natural reseeding may be helpful in improving the production of worn-out natural pastures.

Cultivated Pastures.—On farms on which all the land is subject to cultivation it has been found profitable to plow up old permanent pastures and reseed them. Extensive beef-cattle production is often associated with poor land or cheap land suited only to natural pasturage. Profitable pasturage for beef cattle, however, can be and frequently is provided on farms on which all the land is tillable. Bluegrass is the standard grass for such pastures through most of the area in which beef cattle are raised. Brome grass, red top, timothy, reed canary, and others especially suited to low, wet areas are sometimes planted. In recent years, the practice of planting mixtures of several grasses and legumes, especially alfalfa, medium red and alsike clover, is rapidly growing in favor. If fertile, tillable land is to be used as pasture for beef cattle, it is essential that it produce a large amount of grazing per acre per season. Several practices may be followed that will help to keep this pasture acreage productive: (1) a pasture that has been established for some time can often be improved by a light dressing of well-rotted manure applied in the fall or a light application of commercial fertilizer in the early spring, (2) running a cross fence through the pasture, dividing it into two fields of about equal size, and practicing alternate grazing will increase the yield a little and strengthen the growing plants. (3) Where the topography of the land will permit, mowing weed growth before the weeds have gone to seed will give the grass a better chance and lead to strengthening of the grass plants.

Supplementing Permanent Pastures.—Regardless of how well they may be treated, permanent pastures in cultivated areas are most profitable if they are completely grazed by the beginning of the hot, dry, summer season, then given a rest until cooler weather and fall rains have brought on a new growth. In the different parts of the country different plants are used to provide supplementary summer grazing.

Biennial sweet clover is one of the plants generally used as an early-summer-pasture supplement. Sudan grass is another. Often grains—wheat, barley, or oats—are used with the seeding

timed so that the growth will be 8 to 12 in. high at the time they will be needed. Of all the plants that have been used as summer-pasture supplements, Sudan grass is one of the most popular. Some of the characteristics that make it a valuable summer pasture plant are its low seed cost; its quick, tender, nutritious, palatable growth; its ability to withstand dry weather; its ability to hold its own on weedy land; and its heavy yield of forage and large carrying capacity of about 200 animal unit days per acre per season.[1] Sudan grass has occasionally caused loss of animals from hydrocyanic acid poisoning. However, such losses rarely occur if the plant is allowed to grow to a height of 10 in. before being pastured. Through the Northern one-half of the United States, where a summer supplement to permanent pastures is most needed, the season for resting the permanent pasture and grazing the supplementary pasture is generally a period of about 6 weeks, extending from July 15 to Sept. 1. By this date fall rains have generally brought on a fresh growth in the permanent grass pasture so that the cattle can be returned to it.

Winter Feeding the Beef-cow Herd.—Just as grass is the mainstay of the diet for the beef cow during the grazing season, so roughage must be the principal feed for the winter period; otherwise feed costs will be excessive. A great variety of plant growth may be harvested, stored, and used as roughage for beef cattle during the nongrazing season. In this list prairie hay made from natural grasses allowed to grow through the summer along creek and river bottoms forms the principal roughage in ranching areas where no attempt at growing cultivated crops is made. Where possible, often under irrigation, alfalfa is now grown to replace or supplement the prairie hay. On many ranches a high-protein-content feed, generally cottonseed meal because of its availability, low cost, and high protein content, is fed at the rate of 1 lb. per cow per day to supplement prairie hay.

In the Corn Belt, cornstalks, pastured during the late fall and early winter, after the corn has been husked, form the principal roughage for the beef-cow herd through these months. Corn fodder, often husked or shredded before it is fed, and corn silage comprise a large part of the winter roughage. In areas farther south, sorghum fodder and sorghum silage replace corn

[1] Unpublished data, *Minn. Agr. Expt. Sta.*, St. Paul, Minn.

fodder and corn silage. The legume hay crops are being used more with each succeeding year. Alfalfa and sweet clover in the North, soybeans, red clover, and sweet clover in the Central states, and lespedeza in the Southern states form the principal legume hay crops used as winter roughage for the beef-cow herd.

Where available, straw piles about which cows can forage through the day provide suitable roughage for a part of the ration and will reduce the amount of more expensive roughage required.

Typical allowances of feed for the dry beef cow through a normal 5- to 6-month winter-feeding period, such as is necessary in most parts of the United States, might be

	Tons
Legume hay	1
Nonlegume dry roughage	1½
Nonlegume dry roughage	1½
Silage	2
Legume roughage	¾
Silage	2

Many other roughages may be extensively used in the maintenance of the beef-cow herd according to availability. The experienced beef-cattle producer will plan to provide a sufficient supply of those roughages that combine to the greatest extent high yield per acre and sufficient quality to eliminate a need for grain or concentrate supplement.

The nutrient requirement of the cow that is nursing a calf through the winter months, even though she produces not more than a gallon of milk per day, is much greater than the requirement of the dry cow. Cows nursing calves will need to receive some concentrate in addition to the same roughage ration as the dry cow. Almost any grain or protein concentrate available will be acceptable for this purpose. The amount will depend on the amount of milk the cow is producing. Usually 4 to 6 lb. of grain per day or 1 to 2.5 lb. of a protein concentrate as a supplement to the roughage ration will enable the nursing beef cow to maintain her health and weight. Dual-purpose cows freshening in the fall and being milked through the winter need to be fed a supplemental ration of mixed grains and a protein concentrate in proportion to the amount of milk they

produce. One pound of such a concentrate mixture to each 4 lb. of milk produced is an economical method of calculating such a ration.

Feeding Young Beef Cattle.—The feeding of the young beef calf will depend on the management plan being followed in the specific beef-cattle enterprise under consideration.

Feeding before Weaning.—The calf that is nursed by its mother will do well up to six months old on no other feed except the mother's milk and what grass it will eat. Such a calf should come up to weaning time at six to seven months old weighing 400 lb. If fed grain from a creep in the pasture as soon as it is two and one-half to three months old, the same calf at weaning time should weigh 500 lb. and should have eaten about 300 lb. of grain. Calves born in the fall and nursing through the winter will require some good-quality roughage to take the place of the grass and will eat about 300 lb. of such roughage and 400 lb. of grain by the time they are six to seven months old. The beef calf or the dual-purpose calf being raised on skim milk will consume about 400 gal. of skim milk, 400 lb. of good-quality roughage, and 400 lb. of concentrate by the time it is six to seven months old and will weigh about 350 lb. An excellent grain mixture for the feeding of such young calves may be composed of 1 part, by weight, of coarsely ground shelled corn or barley, 1 part of coarsely ground oats, and 1 part of wheat bran.

Feeding Following Weaning.—Again feeding growing beef calves following weaning will depend on the management plan being pursued. If they are to be grown for feeders to be marketed as yearlings or two-year-olds or if they are heifers to go into breeding herds, the calves must subsist on grass during the grazing season, just as do older cattle. During the first winter, it will be profitable to run calves under a year old in a group by themselves. They must have a legume hay to the extent of one-half their total roughage and good-quality nonlegume roughage for the remainder. If only nonlegume roughage is available, calves under one year old must have a concentrate supplement, or they will do very poorly. Three pounds of grain per head per day or 1 to 1½ lb. of a protein supplement feed will be the minimum required to keep such calves growing normally.

Yearling beef steers and heifers being grown as feeders or heifers to go into breeding herds may be grazed along with mature cows

in summer but will do best if separate from the cow herd in winter. They may receive the same roughage rations that are recommended for the dry cows.

Feeding Purebred Beef Cattle.—The feeding of purebred beef cattle is a somewhat more highly specialized task than the feeding of commercial cattle. The entire herd of purebred beef cattle must be kept in a moderately high condition of flesh at all times in order that they may appear attractive and serve as a help in making sales. This sometimes requires the feeding of more concentrate feeds than would be used on the commercial herd. This extra feed cost for the breeding herd must be considered a part of the advertising cost.

If profitable sales are to be made and purebred cattle sold are to do well in the hands of their purchasers, they must be developed to their full capacity for growth when young. This requires liberal feeding, using the same feeds as already suggested but using principally legume roughage with sufficient grain and protein supplement to promote the most rapid growth of which the young animal is capable. This means feeding a suitable grain ration, which would be one made somewhat more bulky than a fattening ration, to the extent of the appetite of the animal. A grain ration suited to young, growing purebred beef bulls and heifers might be composed by weight of

	Per Cent
Coarsely ground shelled corn or coarsely ground barley...	50
Coarsely ground oats..................................	25
Wheat bran or ground alfalfa hay.....................	15
High protein concentrate supplement..................	10

Growing purebred beef calves need to be fed a concentrate liberally to the age of about eighteen months, when they will have made a large part of their growth and from then on may be expected to do well on the type of ration commonly provided the cow herds, *i.e.*, grass in summer and roughage only in winter.

Feeding the Beef-herd Bull.—It is a common practice on many beef-cattle farms to allow the herd bull to run with the cow herd the year around and subsist on pasture alone in summer and the same roughage ration that is fed to the dry cows in winter. Running the herd bull with the cow herd on pasture is the practical, economical plan of managing the breeding of the cows and the feeding of the bull. It is preferable that the bull be kept

away from the cow herd during the winter months and that he have a comfortable box stall as his winter shelter. In addition to the same roughage ration that is available for the cows, he should receive a moderate light-weight grain ration similar to that recommended for young, growing, purebred cattle. Such care and feeding will generally be repaid by higher fertility and a higher percentage of cows getting in calf during the following breeding season. Some beef-cattle breeders provide a pen in the pasture near the watering place into which the herd bull may be turned once each day in summer for a feed of grain. Except in purebred herds, where it is desirable to keep the herd bull in moderately high flesh, because of the advertising value of an attractive-appearing herd bull, such summer feeding is not economical or necessary.

Feeding Fattening Cattle.—Mature or nearly mature beef cattle on good pasture will become sufficiently fat toward the close of a grazing period of 4 to 6 months to make beef of medium to good quality carrying enough fat to suit a high percentage of beef consumers. Many such grass-fat cattle are slaughtered in the United States and throughout the world each year. The highest quality beef, however, is secured from cattle that have been fattened on grain for a period of 4 to 8 months before they are slaughtered. In the United States, more than in most countries of the world, the fattening of cattle on grain has become a general practice insofar as the economic factors affecting the enterprise permit.

Advantages of Fattening on Grain.—From the many advantages accruing from the fattening of cattle on grain, the producer, the processor, and the consumer all benefit. By fattening on grain, the producer increases the weight of the animal, improves the quality of the meat, and secures a higher selling price. In so doing, he markets feed to advantage. The processor and retailer benefit through the higher percentage of dressed weight, the more attractive appearance of the beef, and its greater keeping quality. The consumer benefits from the higher nutritive value, the more desirable taste, and the more attractive appearance of the beef after it is cooked.

Feeds for Fattening on Grain.—Early in the development of fattening cattle on grain in the United States, corn became the concentrate par excellence for this purpose. The high carbo-

hydrate content of corn, accompanied by a moderately high oil or fat content and a moderately high protein content, its low fiber content, with consequent high-percentage digestibility, its high palatability, high yield and keeping quality when stored combine to give corn its high rank as a cattle-fattening concentrate. In the earlier years of the development of the cattle-fattening enterprise, when mature cattle were the only class of cattle fattened, corn alone as the concentrate with a carbonaceous roughage such as prairie hay, timothy hay, corn fodder, or straw constituted the usual fattening ration, with salt and water the only supplements. During this period many mature steers went to market weighing 1,600 lb. or more, after having been on feed from 9 months to a year and after having eaten from 75 to 100 bu. of corn per steer. Strange as it may seem now, it was this type of beef that popularized corn-fed beef in the large cities of our own country and in foreign countries.

Progress in Feeding Practices.—Largely because of results of many experiments in cattle fattening carried on by agricultural experiment stations and knowledge concerning nutrition contributed by the science of biochemistry, great progress in cattle-fattening methods and in the selection and preparation of more economic and more effective cattle-fattening rations has been made during the last fifty years. Some of the more important practices resulting from these findings are (1) Cattle are now fattened at much earlier ages than formerly. It has been learned that by correct feeding a calf can be kept fat from birth to maturity, or he can be put in the feed lot in thin condition at any age and be made fat in from 5 to 7 months. (2) It has been demonstrated that many concentrate feeds other than corn may be used as the basal feed in the cattle-fattening ration, with practically the same rate of gain and often at lower cost. (3) It has been demonstrated that the use of a legume hay as part or all of the roughage fed to fattening cattle rather than a carbonaceous roughage only is one means of increasing the rate of gain and lowering the cost of gains. (4) It has been demonstrated that the addition of a high protein content supplement to the ration generally results in more rapid gains, a more attractive appearance of the cattle at the close of the feeding period, and lower feed cost. (5) It has been found that extensive preparation of feeds, such as fine grinding of grain, cooking of grain, fine

grinding of roughage, and thorough mixing of feeds before feeding them to fattening cattle is not necessary and often not economical.

Starting Cattle on Feed.—When thin cattle unaccustomed to receiving grain are put in the feed lot to be fattened, they must be started on a small allowance of the concentrate ration and gradually increased up to approximately their full capacity to consume grain through a period of about 4 weeks; otherwise trouble from digestive disturbances such as scouring, bloat, and loss of appetite or "going off feed" are likely to occur. Thin feeder cattle will gain well during the early part of the feeding period on a liberal allowance of good-quality roughage and a limited amount of concentrate. It is good economy to bring them up to all of the concentrate they will eat through a period of 4 to 6 weeks' time.

Feed Requirement, Rate of Gain, Length of Fattening Period, and Feed Utilization by Cattle of Different Ages.—When receiving a typical concentrate ration of farm-grown grains plus a protein supplement, fattening cattle, regardless of age, should consume about 2 lb. of concentrate per 100 lb. of live weight per day. Fattening calves put on feed when six to nine months old should gain at the rate of 2.25 lb. per day; yearlings, 2.5 lb.; and two-year-olds, 2.75 lb. The average length of feeding period required to fatten calves is 200 days; yearlings, 170 days; and two-year-olds, 120 days. Thus the fattening calf should gain 450 to 500 lb.; the yearling, 400 to 450 lb.; and the two-year-old, 300 to 350 lb.

About the same total amount of feed will be required by cattle of each of the three age groups. A typical requirement is about 2,200 lb. of grain, 200 lb. of protein supplement, and 1,000 lb. of dry roughage or its equivalent in silage or grass. It will be noticed from the preceding figures that calves utilize feed most efficiently in making gains whereas two-year-olds use their feed least effectively. This is because the calf is building bone and muscle growth as well as fat, whereas the two-year-old has stopped growing and can utilize only those compounds in his feed suitable for fat formation. Two-year-olds gain most rapidly, and calves show the smallest daily gain.

Some Typical Cattle-fattening Rations.—As already mentioned, a wide variety of feeds may be successfully and profitably used in the feeding of fattening cattle. Since the great bulk of fattening

is conducted in the Corn Belt area of the United States, only a few rations typical of those commonly fed in this area will be cited:

	Per Cent
Shelled corn	90
Protein supplement	10
Legume hay, free choice	
Corn silage, free choice	
Corn-and-cob meal	90
Protein supplement	10
Legume hay, free choice	
Ground barley	60
Ground oats	30
Protein supplement	10
Legume hay, free choice	

Factors Affecting Profits from Cattle Fattening.—Many factors influence the profit from the cattle-fattening enterprise. The more important of these are (1) the price margin secured, (2) the feed cost per 100-lb. gain, (3) cost other than feed, (4) the death loss.

By price margin is meant the difference between the net cost of the feeder animals per 100 lb. when purchased or their value when placed in the feed lot and the net price received per 100 lb. at the feed lot at the close of the feeding period. The margin necessary to allow a profit varies widely under different conditions. Many factors influence it. A minimum margin of $1.50 per 100 lb. at the feed lot is generally necessary if the feeder is to break even. The larger the margin the larger will be the profit per animal.

The feed cost per 100-lb. gain may influence profits materially. As a rule, the feed cost per 100-lb. gain closely approaches the selling price per 100 lb. In numerous instances, cost of gains has exceeded the selling value of gains. In such instances, if a large margin is secured, a profit may still be made. It is always the aim and the hope of the cattle fattener, however, that he may be able to keep the cost of gains below the selling value of the gains and thereby add to the profit gained from the margin rather than detract from it.

Costs other than feed include such items as labor, interest on investment in cattle and equipment, taxes, depreciation of

equipment, and other minor charges. The total of all costs other than the cost of the feeder cattle and the feed is not a large item, but judgment must be used in keeping such costs as low as is commensurate with comfort and good care of the cattle. The value to the farm of the manure produced and the crop-rotation system made possible by the feed utilization of fattening cattle is a credit that will generally balance or nearly balance this charge.

The risk of loss of animals by death during the feeding period is light, and death loss does not constitute a large hazard in cattle fattening. Care must be taken in buying feeders, however, to ensure freedom of cattle from disease at the time of purchase, and care must be exercised to avoid the introduction and spread of infectious diseases or development of nutritional diseases while the cattle are on feed. Because of the sizable sum of money represented by each animal, severe death loss may and occasionally does prove disastrous to the cattle fattener.

Questions

1. Why is grass extensively used in the feeding of beef cattle?
2. Define: natural grazing lands, cultivated pastures, supplemental pastures.
3. How may each of the three types of pasture be used to best advantage?
4. State the winter feed requirements of the beef-cow herd.
5. How should the beef calf be fed before weaning?
6. How should the beef calf be fed following weaning?
7. To what extent does proper feeding of purebred beef cattle differ from the feeding of commercial cattle?
8. What are the advantages of fattening cattle on grain to the producer? To the processor and retailer? To the consumer?
9. State several practices now generally followed in feeding fattening cattle as a result of experimental research.
10. What precautions should be taken in starting fattening cattle on grain feeding?
11. How much concentrate should a beef animal consume per day when on full feed?
12. What would be considered satisfactory daily gains for calves, yearlings, and two-year-old fattening cattle?
13. What is the approximate length of feeding period required to fatten typical feeder calves, yearlings, two-year-olds?
14. How does the age of feeder cattle affect the total amount of feed required to fatten?
15. Cite three typical cattle-fattening rations.

16. What are the important general factors affecting profits from cattle fattening?

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CHAPTER XI

THE MANAGEMENT AND CARE OF BEEF CATTLE

Regardless of the specific enterprise that may be chosen, any worth-while beef-production plan involves the investment of considerable capital in proportion to the probable returns. Profits from each animal raised or fattened are small except in an occasional purebred herd where unusual success may result in a large profit from a few animals. Profits from beef cattle are largely dividends from an investment rather than earnings of labor. Sound, capable management is therefore of great importance in beef production.

Specialized Production Plans.—The day of profits from beef cattle with hit-or-miss production methods has passed. The first requirement in management is careful consideration of the several specialized production plans and selection of the one that best fits conditions on the farm in question. The list of opportunities for specialization includes (1) maintaining a cow herd and marketing calves as fat cattle, (2) maintaining a cow herd and marketing calves as feeders, (3) fattening purchased cattle, (4) maintaining a dual-purpose herd, and (5) breeding purebred cattle.

Maintaining a Cow Herd and Marketing Calves as Fat Cattle.—This is one of the production plans commonly followed on farms on which pasturage and winter feeds for the cow herd as well as grain for fattening cattle may be economically provided. It is especially well adapted to many Corn Belt farms. If this enterprise is to be the chief source of income, the farm must be large enough to support a minimum cow herd of about 25 cows; otherwise the income will not be large enough to maintain the farm and provide a living for the family.

Successful management of this enterprise requires conservative purchase of foundation cows. The most favorable time to start such an enterprise is during a period of low prices for cattle. Then high-grade cows or heifers or purebred females of one of the beef breeds may be secured at prices low enough to permit a

profit. In starting a herd of this kind, during times of high prices, it will be safer to start with females of lower grade and cost and plan to build up the merit of the herd by the use of good sires.

On farms that include a large acreage of nontillable, permanent pasture, it may pay best to carry the calves to the yearling age and put them on feed to fatten in the fall of their second year, when they will be from sixteen to twenty months old. On most farms, however, it is found most profitable to creep-feed the calves' grain during their first summer while

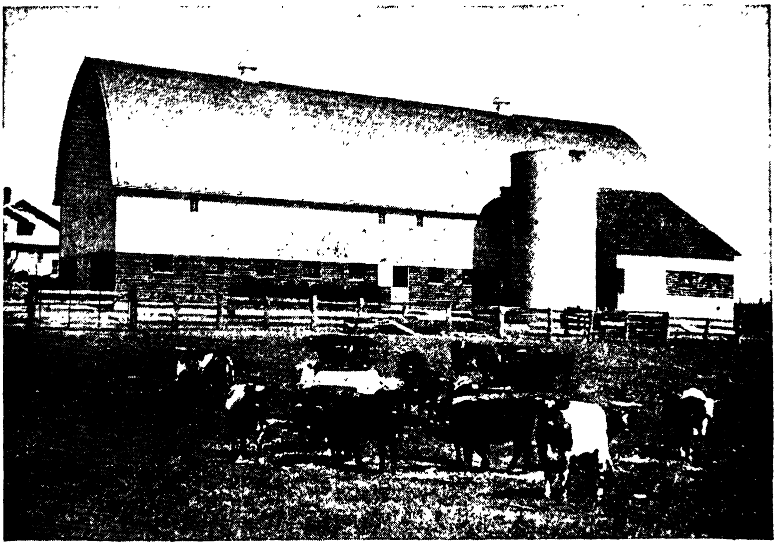

FIG. 22.—Beef cattle barn on purebred Shorthorn cattle farm of Blotz Bros., Dodgeville, Wis. A roomy barn with silo and spacious loft simplifies storing of feeds and care of cattle in winter. (*Courtesy The Shorthorn World.*)

their mothers are nursing them, put them on the fattening ration at weaning time, and market the following spring or summer, when they will be from twelve to sixteen months old and should weigh from 850 to 1,050 lb., carrying sufficient fat to satisfy the most exacting market. Cattle of this kind are often referred to as "baby beeves," though in market terminology they are "fat yearlings."

This enterprise requires a comparatively small investment in buildings and equipment. If the cows are bred to calve during the spring months, an inexpensive shed costing from $500 to

$800 will provide satisfactory winter shelter for the herd of 25 cows, and a similar shed costing $400 to $600 will provide suitable shelter for the fattening calves. The major investment must be in land and cattle. The labor requirement for this enterprise is low, especially during the summer months, when cows and calves are on pasture. A 25-cow herd has been cited as a minimum economical unit for this enterprise, which may readily be expanded on larger farms.

Maintaining a Cow Herd and Marketing Calves as Feeders.—This form of specialization in beef-cattle management differs principally from the preceding plan in that it is best adapted to the larger farms and ranches on which feeds for fattening cannot be profitably grown. Calves raised are of necessity sold in thin condition at weaning time or at more advanced ages. Since the feeder animal sells for about one-half or less than one-half the price received for the same animal when fat, the minimum size of cow herd for a successful family-sized unit of production will be about 50 cows. This production plan succeeds best in Range or semiarid regions, where land values or rentals are determined by the productivity of the land in this one enterprise and the beef cattle have no competition for the use of the land except from sheep. All lands in the United States suited to the production of feeder cattle are also suited to the production of sheep. A choice as to whether he will produce feeder cattle or sheep must always be made by the operator of such lands. Some of this land is used to slightly better advantage by sheep and some by cattle, but the dominant factor responsible for the fact that all lands suited to feeder cattle and sheep production remain divided between the two is the market for the products of each. Were all the land suited to the production of feeder cattle used for that purpose, the cattle market would be oversupplied, and cattle would decline in price. Likewise, if all the land suited to the production of sheep were used for that purpose to the exclusion of cattle, the market for the products of sheep would be oversupplied, and sheep prices would decline. Effect of the law of supply and demand has established a division of the land suited to feeder cattle and sheep production at about the point most favorable to both.

This type of production enterprise requires a still smaller expenditure for equipment and labor and requires a propor-

tionately larger investment in land or rentals and cattle than the raising and fattening of calves. It is a type of enterprise that readily permits of large expansion if the necessary capital can be provided. Occasional severe losses due to drought or low prices resulting from overproduction in recent years has brought about a trend toward the breaking up of many large ranches into smaller ones.

The raising of calves to be marketed as feeders is recommended only for farms and Range lands on which feeds for fattening cannot be profitably grown.

Fattening Purchased Cattle.—Purchasing thin cattle and fattening them on grain or other concentrate feed is a beef-cattle enterprise best adapted to farms on which all or nearly all the land is suited to the growing of corn or the small grains and legume hay crops. The thin cattle are usually purchased during the fall and marketed during the spring months, thus releasing the labor supply for the growing and harvesting of crops during the greater part of the crop season. The fattening of purchased, thin cattle in the United States developed as a result of the stocking of the Range and the growing of corn. The Range area needed a market for feeder cattle, and the Corn Belt needed the feeder cattle as a means of marketing part of the corn. The beef market of the United States does not require that all cattle be fattened on corn or grain before slaughter, but it can and does absorb a large supply of corn-fed or grain-fat cattle at prices permitting a profit from this enterprise.

Availability of feeds suited to fattening is the most important factor to be considered in deciding whether this enterprise should be undertaken. It is adapted as a side line on small farms, where only a few cattle may be fed, and it is equally well adapted to large-unit operation, where several hundred cattle may be fattened. The factor limiting the size of the enterprise will often be the supply of suitable feed available. Many cattle fatteners expand the enterprise beyond the capacity of their own farm to produce feed and purchase additional feed. As stated in the chapter on Feeding Beef Cattle, profits from cattle fattening depend on the margin in selling price over cost price per pound, on the cost of gains per pound compared to selling price, and on the amount of overhead expense and death loss.

Purchase of suitable feeders at a price that will allow a margin of at least $1.50 per 100 lb. should be the aim of the cattle fattener. Whether this is being done can never be determined with certainty at time of purchase, because the price the cattle will bring when fat cannot be known until several months later, when they are ready to be sold. Generally, cattle fattening is most hazardous when feeder cattle are high in price, even though feed may be plentiful and cheap. The fattening enterprise is least hazardous when feeder cattle are cheap, even though feed prices may be high. In times of high prices for feeders, the

Fig. 23.—A feed lot, showing group of choice Range-raised feeder calves, grain bunks, and simple, cheaply constructed hay feeding arrangement. (*Photograph by Cook and Gormley.*)

fattener may often afford himself some protection by being content with feeders of lower grade at prices proportionately below the market top. Some of the largest profits from cattle fattening have been made in fattening feeder cattle of the lower market grades.

The value of the manure produced by fattening cattle is higher per ton of feed used than for any other type of animal. This is because of the highly concentrated ration required, and the low efficiency of beef cattle in feed utilization. In a few instances, such as in the growing of tobacco and hops, cattle fattening is often carried on as a side line, primarily because of the high

value of the manure when applied to the land. Under any circumstance, the manurial value of the cattle-fattening enterprise must be one of the factors considered, and the cattle-fattening enterprise is most favorably located when advantage may be taken of the manure value by applying it to land that needs it.

Maintaining a Dual-purpose Herd.—The production of dual-purpose cattle has persisted on the belief that the total financial return per year from a cow capable of producing an average amount of milk and a calf that can be grown on skim milk and fattened into an acceptable beef animal will be greater than the

FIG. 24.—Group of steers produced from high-grade Milking Shorthorn cows.

annual income from a higher producing milk cow whose calf is suitable only for veal or a specialized beef cow whose milk production will be sufficient only to raise her calf. Another contention favoring the dual-purpose enterprise is that milk and beef are not likely to sell at low prices at the same time, and the one product thus serves to protect the other against low-price periods. In practice, the highly specialized dairy cow has demonstrated her superiority in earning capacity over the dual-purpose cow on farms in localities especially suited to dairying. Likewise, the cow of beef type has demonstrated her superiority wherever calves are raised by allowing them to be nursed by their mothers.

In practice, the dual-purpose production plan finds its place on the farm advantageously located for the dairy enterprise but with pasture acreage and feed supply beyond the amount that can be used to advantage by the number of milk cows that can be properly cared for and milked. If, in this case, the cow herd is of dual-purpose type, the calves may be raised and used to supplement the cow herd in utilizing pasture and winter feed without a proportionate increase in equipment and labor required. If the farm is one on which pasture and hay crops predominate, the calves can be grown to the age of two to three years and be marketed as grass-fat or feeders. If corn or grain is available, the calves raised may be fattened as yearlings or two-year-olds. Shelter for the dual-purpose herd requires first a dairy barn equipped just as it would be for a specialized dairy cow herd. A supplementary shed for housing the growing or fattening cattle will also be needed.

Confidence in the dual-purpose production plan and a liking for cattle of this type are frequently the deciding factors in the selection of this enterprise, just as the same influences are frequently the deciding factor in the selection of other livestock-production enterprises.

Breeding Purebred Cattle.—The breeding of purebreds may be readily adapted to any farm suited to any other kind of beef-cattle enterprise. Economically, the objective in breeding purebreds is the making of a larger net profit from each animal produced than can be secured in commercial production. The management of a purebred herd, however, requires understanding and attention to many details not encountered in the management of commercial cattle. It requires greater skill in the buying of breeding stock, a larger investment per animal, and, above all else, ability to develop a successful sales plan for selling the produce of the herd.

Besides considering the suitability of the farm to the beef-cattle enterprise, the manager contemplating entering into the breeding of purebred beef or dual-purpose cattle should consider carefully his own knowledge or purebred-beef-cattle management. He should be sure that he has an enthusiastic liking for purebred beef cattle and that he possesses the qualifications of a successful salesman.

Many purebred-beef-cattle herds are maintained by men of wealth as an avocation. Such breeders often provide elaborate

equipment, are generous in their purchase of breeding stock, and often look to the enjoyment they get from the development of the herd and the exhibiting of cattle at livestock shows as a part of the dividend from the enterprise.

Equipment for the Care of Beef Cattle.—The thick flesh covering, the moderately thick skin, and the dense coat of hair, which grows to a length of an inch or more as winter approaches, combine to afford beef cattle good natural protection against cold. As a result, warm buildings are unnecessary for housing, even in cold climates. The ability of beef cattle to eat coarse feeds and whole grain with little preparation before feeding reduces the need of equipment for feeding to a few simple accessories.

Shelter.—Many beef producers prefer to build substantial barns or sheds for the housing of their cattle, but the simplest, cheapest type of shed will suffice should financial circumstances so dictate. Barns or sheds should be planned to house cattle in groups, running loose rather than tied singly, or in small box stalls. In the Northern half of the United States, the shed or barn used for wintering the cow herd should be equipped with a calf creep in one end, into which calves still being nursed by their mothers may go to be fed grain and hay and to lie down on a clean, dry bed of straw. If the cows are bred to calve in the spring of the year, as they should be in the Northern half of the United States, most of the calves will be ready to be weaned when the cow herd goes into winter quarters, but there are always likely to be some late summer calves that should nurse until December or January, and there are often some early ones in the spring that should be dropped before the herd goes to pasture. A small, separate building equipped with a box stall or two for housing the bulls in winter and an extra box stall or two into which cows calving early in the spring may be placed for a few days at calving time or that may be used as hospital stalls for housing an occasional sick or injured animal should be provided. The barn or shed for housing the cow herd in one group and the fattening calves or growing cattle in another may be all under one roof, divided only by a partition.

Barns or sheds for housing purebred herds need be no more elaborate than buildings for housing commercial cattle, but they must be divided into more pens and box stalls so that closer attention and care may be given individual animals requiring it.

The manager contemplating the building of housing for a purebred herd is advised to visit several successful purebred farms for observations, information, and ideas about the building needs for this enterprise.

Working Equipment.—On most beef-cattle farms, especially through most of the Corn Belt, one of the first purposes for which money may be spent to advantage after shelter has been provided is the building of a concrete slab about 4 in. thick over the area just in front of the shelter, where the hayracks and grain and silage bunks will be placed. Such a floor will pay a big dividend by keeping the cattle out of the mud during the spring and sometimes during the fall months. Such a floor also simplifies the work of picking up and hauling out manure and makes the lot much more sanitary.

Feed racks for roughage and bunks for feeding grain and silage are best located on these concrete floors outside the shelter, in all except possibly the Northern tier of states, rather than inside the buildings used for shelter. Many types of feed racks, grain bunks, and self-feeders have been devised for the feeding of beef cattle. Also, many plans of manger arrangements for inside feeding in the colder climates have been devised. For detailed information on this subject, the reader is referred to specialized publications dealing with it.

Whether a silo should be provided as part of the equipment on a beef-cattle farm is still open to argument. Some beef producers believe that silage is an unnecessary and uneconomical feed for beef cattle; others prefer to use it. Probably the most logical answer to the question is that in localities favorable to the production of heavy yields of corn silage, the investment in a silo will pay, whereas in other localities it will not.

Placing of feed in the racks and bunks is generally most easily accomplished by using a team and wagon to haul hay to the racks when needed and to haul grain and silage from storage to the feed bunks at each feeding time. A feed carrier operated on an overhead track from the silo or grain-storage building is often used in the smaller establishments.

On any farm on which a worth-while beef-cattle enterprise is being carried on, a central water-supply tank should be provided from which the water can be piped to small water tanks automatically controlled by a float. In the colder climates during the

winter months, these tanks should be heated by an electric immersion heater or a kerosene heater.

On large farms or ranches where a large number of animals are maintained, a chute with a squeeze through which cattle can be driven and held for such operations as dehorning, branding, or marking for identification, testing for tuberculosis and Bang's disease, and for other minor operations is a practical and necessary equipment item.

Although not essential to successful management or good feeding practice, it is considered by most large operators that a grain-grinding as well as a roughage-cutting unit can be made to pay dividends if judiciously used.

The Caretaker's Work.—Skillful planning of shelters and arrangement of equipment for convenience of work can do much to reduce to a minimum the manual labor required in the care of beef cattle. Aside from preparing and placing feed before the cattle, cleaning and bedding shelters, and keeping the water supply operating, the principal work of the caretaker will be to keep a close watch on the progress of each animal from day to day and to give attention to any animals that for any reason are in trouble or are not doing well. The keenness with which a caretaker can detect approaching trouble from any cause and head it off before it becomes serious will in a large measure determine his success as a beef-cattle man. A complete list of all the possible sources of trouble for which he must be on guard would, indeed, be a long one. Many are of minor importance and occur infrequently, such as injuries, bloat, difficult parturition, the appearance of external parasites, and many others. Neglect of a single case of such nature might have little effect on the enterprise, but continual neglect of all of them is likely to render any beef-cattle enterprise unprofitable.

Important Cattle Diseases.—It is not the purpose here to attempt a discussion of the diseases or parasites of cattle but simply to call attention to the list of diseases and parasites commonly affecting cattle in the United States, so that the producer may know the probable sources of trouble from them. A thorough knowledge of disease prevention and treatment must be gained from the field of veterinary medicine, and often the problems can be solved only with the help of the practicing veterinarian.

Tuberculosis has, in the past, been the most insidious and devastating of all cattle diseases. It was also one of the first to be brought under control and practically to be eliminated from the country. Guarding against its introduction into a herd by the testing of new animals as they are purchased and testing the entire herd, preferably once each year, is proving a successful method of preventing a serious spread of a new infection in a breeding herd, once it has been eliminated.

Bang's Disease.—This is at present the most damaging and perplexing disease of cattle. Testing and elimination of reacting animals is the only known method of ridding a herd and premises of an infection. Testing of new animals purchased and testing the entire herd annually is being practiced as a means of keeping the herd clear of the infection. Since testing and elimination for this disease have not yet covered the entire cattle population, there are still many infected herds, with consequent opportunities for reinfection of clean herds. Many sudden outbreaks of the disease in herds that have once been free of the infection without a visible cause or source of the reinfection is a perplexing characteristic of the disease.

Producing immunization by vaccination of young animals as a means of controlling this disease is being given a thorough trial and meeting with some success, but in all probability the same procedure followed in the bringing of tuberculosis under control, that of testing and eliminating carriers of the disease by the area plan, will proceed until elimination of most of the infection will in time reduce losses to a negligible item, as it has done with tuberculosis.

Anthrax and Blackleg.—These two diseases are to a considerable extent localized and constitute a menace only in infected areas. They are kept under control successfully by vaccination.

Foot-and-mouth Disease.—This disease has on several occasions made its appearance in the United States, but each time it has been successfully stamped out by quarantine and destruction of infected animals.

Hemorrhagic Septicemia or Influenza.—This disease has caused about as much worry on the part of cattle men in the United States during recent years as any other. It is generally fatal only when followed by pneumonia. Many infected animals recover, but a few out of every infected group generally die.

No highly successful means of preventing or treating the disease is known. It is largely a calf disease and seldom affects cattle over a year old.

Actinomycosis.—This disease, commonly called "lump jaw," is caused by a bacteria (*Actinomyces bovis*). Clinical symptoms are local suppurating tumors about the jaw. It may be spread by cattle taking the bacteria into the digestive system on food that has been soiled by the pus from a tumor on an infected animal. It is infrequent and spreads slowly in a herd. Infected animals should be isolated or eliminated from the herd; otherwise, it may become a serious problem.

Calf Scours.—This disease is of two types, an infectious type due to a specific organism and a noninfectious type due to improper feeding. Both types generally affect calves at a very early age, and either may cause heavy losses. Unless a caretaker thoroughly understands treatment himself, this problem is one requiring diagnosis and treatment by a professional veterinarian.

Pinkeye.—This is a disease affecting the eyes of cattle. It is mildly contagious. If allowed to run its own course, most animals in the herd will become affected, but most of them will suffer little inconvenience except that an occasional animal may become permanently blind in one or both eyes from it. The most effective treatment seems to be to place affected animals in a darkened stall and to bathe the eyes twice daily with a saturated boric acid solution.

Bloat.—Bloating, or the rapid formation of gas in the digestive system, is the cause of an occasional death in cattle. Bloating generally results from the eating of a large amount of certain feeds favorable to the rapid development of certain kinds of gas-forming bacteria in the digestive system. Knowing the errors in feeding most likely to cause bloat and avoiding them is the only means of preventing frequent cases. Giving the bloated animals 1 oz. of turpentine in a pint of water or milk as a drench, if the animal is small, or 2 oz. if the animal is full-grown, will generally bring quick relief. In extreme cases the paunch is punctured at its most distended point with a small knife blade to allow the gas to escape, thus bringing immediate relief.

Parasites.—Seldom do internal parasites cause serious trouble in cattle. There are several external parasites such as lice, mange, and ringworm that must be taken in hand promptly if

they make their appearance. Such external parasites are easily eliminated by treatment with standard insecticides.

Questions

1. Why is capable management essential to a profitable beef-cattle enterprise?
2. State five specialized beef-cattle-production plans.
3. State the specific adaptations of each of the specialization plans.
4. State several requirements in providing suitable shelter for beef cattle.
5. What are the important items of working equipment in beef-cattle management?
6. What are the important duties of the beef-cattle caretaker?
7. Name the important infectious diseases affecting beef cattle.
8. What noninfectious diseases sometimes give trouble?
9. What parasites commonly affect beef cattle?

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CHAPTER XII

JUDGING BEEF CATTLE

The beginning point in the judging of beef cattle is the acquiring by the judge of a mental picture of the standard or perfect animal.

The Score Card.—The score card describing the appearance of the ideal animal, part by part, with importance of each part indicated by a proportionate number of points in 100, has been found to be a good means of creating the outline of this picture. Since the ideal fat steer ready for slaughter is the highest attainable standard in beef-cattle production, the description and score for such a steer are presented.

Since the requirements of a beef steer are the same regardless of his ancestry, this score card serves equally well for steers of Shorthorn, Hereford, Aberdeen Angus, or any other breeding. With minor modifications, it serves also as a satisfactory score for breeding animals of the several beef breeds. The description given is intended to convey especially a picture of the correct type for the beef animal. The descriptive terms used serve also as a vocabulary for use in criticizing an animal. The diagram in Fig. 25 shows the location of the points of the animal.

To develop further the image of the ideal animal, the beginner in judging must do some practice scoring of living animals and have his scores criticized by a qualified, experienced judge. Some of the animals scored should be nearly perfect and some quite inferior in order to develop an appreciation of the wide variation that exists between very good and very poor animals.

Comparative Judging.—Once the beginner has gained a fairly accurate impression of the ideal fat steer, he is ready to try his hand at the comparative rating of several steers for the purpose of building up ability to evaluate more accurately different deficiencies in an animal. It is one thing to observe and point out the deficiencies in an animal but quite another to decide just how damaging to the animal each of those deficiencies is and to

Perfect Score for Fat Steer

Scale of Points		Perfect Score
I. Weight, score according to age		8
Six months	450 lb.	
Twelve months	850 lb.	
Eighteen months	1,100 lb.	
Twenty-four months	1,350 lb.	
II. Form—52 points		
Head and neck—7 points		
Head. Muzzle broad; nostrils large; eyes large, clear, quiet expression; face short, clean-cut; forehead broad; ears medium size, fine texture, well-carried; horns fine texture, medium size, well-shaped		5
Neck. Short, thick; throat clean		2
Forequarters—8 points		
Shoulder vein. Full, plump		2
Shoulders. Smooth, well-covered with flesh; rounded yet compact on top		4
Brisket. Neat, trim, with little dewlap		1
Legs. Straight, short, wide apart; arms full; shank medium fine		1
Body—25 points		
Chest. Wide, deep, full; heart girth large		3
Back. Straight, broad; covered with thick, smooth, firm flesh, crops full		8
Ribs. Low, arched; thickly and smoothly covered with firm flesh		5
Loin. Straight, broad; covered with thick, smooth, firm flesh		8
Flank. Full; even with underline		1
Hindquarters—12 points		
Hips. Laid in and smoothly covered		2
Rump. Long, wide, level; thickly and smoothly fleshed; tail head broad and smooth, not patchy		4
Thighs. Full, deep, wide		3
Twist. Deep, plump		2
Legs. Straight, short; shank medium fine		1
III. Finish. Degree of fatness indicated especially by spinal covering, rib covering, and fullness of flank; also by fullness of cod and tongue root; proper finish indicated by a mellow yet firm and springy touch		10
IV. Quality. Smooth in frame and flesh; hide medium fine; head and horns medium size		10
V. Dressing percentage. High finish; lightweight hide; not paunchy		10
VI. General appearance. Straight top line and underline; deep, low-set, compact, broad, uniform in width; symmetrical, not paunchy, stylish		10
Total		100

NOTE: The score card was prepared by staff members of the Division of Animal Husbandry, University of Minnesota, for use in the teaching of judging.

summarize the significance of their total. One of the best procedures in mastering this phase of training in judging is practice in rating animals in small groups in the order of their merit. The value of this type of practice is that the presence of several animals helps the beginner to decide in what requirements each one is weak and just how weak it is. For instance, if four or five steers are brought together, one of them is quite certain to appear broader across the shoulders than the others, one is

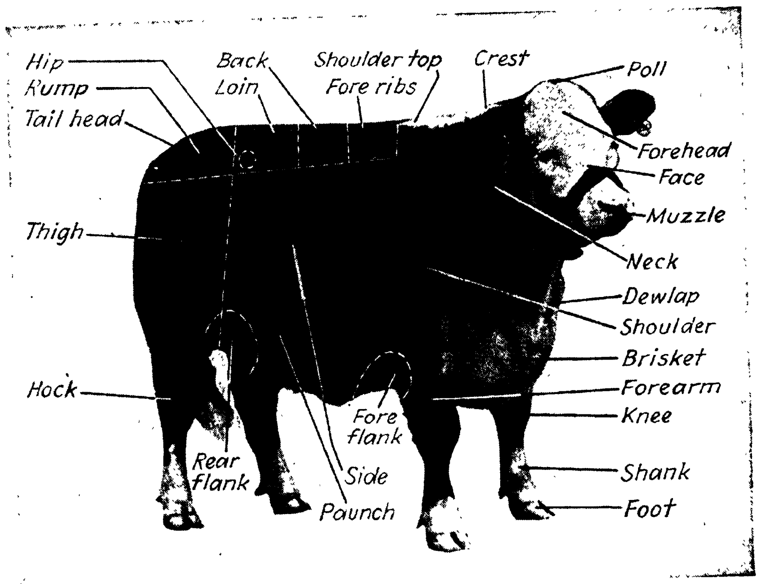

FIG. 25.—Showing location of parts of the beef steer.

quite likely to be muscled deeper in the thigh than others, one is quite certain to show finer quality of bone than others, and one is quite likely to appear fatter than others. If then the judge's mental image of the ideal requirement in one or all of these points fails him, he may still arrive at a correct decision simply by comparing the animals before him with each other. By this plan, he may develop proficiency in rating animals one against another, and this will help to build up the image of the perfect animal in his mind. Again the beginner must depend on criticisms and corrections of a more experienced judge to guide him in attaining proficiency in this feature of judging.

The ultimate objective of all judging is the placing of a valuation or a rating on an animal for the purpose it is to serve. This value in dollars per 100 lb. or per animal will, of course, depend on many influences. In buying on the market, for instance, the buyer or salesman must know the going market price at the time. There may be a temporary demand for some specific market class and grade of animal that has thrown it temporarily out of line in price. In valuing purebred animals for breeding use in terms of dollars, there are frequently wide fluctuations in values and always wide variation between prices obtainable for the best ones as compared with those obtainable for the poorer ones. Always, however, one of the important factors determining values is the degree to which the animal itself approaches the ideal in those requirements that are measured by the eye and sometimes the touch of the competent judge.

Classifying and Grading Market Cattle.—Determining the market class into which any animal will fall is comparatively simple, since one needs only to determine the use to which the animal logically would be put. Class is determined by such characters as approximate age, approximate weight, sex, and comparative fatness. The grading of cattle after they have been classified requires first a clear understanding of the grade requirements and limitations, then keenness of observation and ability to make the mental calculations necessary to an accurate appraisal of the degree to which the animal approaches the ideal requirements for the purpose it is to serve. Once ability to classify and grade cattle accurately for their immediate use has been acquired, the buyer or seller may easily complete the process of evaluating any animal by weighing it and applying the quoted price for cattle of that class and grade.

Selecting Feeder Cattle.—Many feeder cattle are bought each year in many different ways. In arriving at the suitability of a group of cattle as feeders and in arriving at the going market price at which they should sell, the seller and the buyer must first classify and grade them. The judging or evaluating of feeder animals cannot be done so accurately from appearance as can the judging of the steer or heifer that is to be immediately slaughtered. The value of the feeder is determined by his performance in the feed lot. The rate at which he will gain, the amount of feed required to make 100 lb. of gain, and the grade of carcass he will

produce when fat are the qualities that determine his value as a feeder. None of these qualities can be predicted with a very high degree of accuracy from appearance alone. Nevertheless, appearance is the beginning point in the selection of feeders, just as it is in the selection of other market classes of cattle. Appearance, or what one can see as to the breeding, type, form, and muscle development in the thin feeder animal, is a more reliable guide as to the market grade he will make when fat than it is to the rate at which he will gain or the amount of feed that

FIG. 26.—The crossbred Aberdeen Angus-Shorthorn steer Loyal Alumnus. Grand Champion steer over all breeds, International Livestock Exposition 1941. Near perfection in beef type. (*Photograph by Abernathy.*)

will be required to produce 100 lb. of gain. Rate at which feeder cattle will gain depends on the age, sex, condition, or amount of fat they carry at the beginning of the feeding period, their health and, of course, the care, management, and suitability of ration that is given them. The amount of feed required to produce 100 lb. of gain will also be influenced by the preceding factors. In addition to these influences, both rate of gain and feed required per 100 lb. of gain in feeder cattle vary widely with individual animals, apparently for causes not covered in the foregoing list.

A search for additional causes of such variations leads to the conclusion that they result, at least partly, from inherited characters that do not show in any way in the visible make-up of the animal. Whether any specific animal will be a rapid gainer or an efficient user of feed might be determined more accurately were records of the gaining ability and efficiency of feed utilization of his ancestry available. In the production of feeder cattle such records have never been kept except in an experimental way. The keeping of complete records of the rate of gain and feed consumption of individual heifer calves that are to become future brood cows in feeder cattle-producing herds is not practical. It is probable, however, that the keeping of records of the weight of heifer calves at one year or at eighteen months old would be practical as an aid in selecting those heifers that are to be retained in the breeding herd. Once a cow herd was built up from heifer calves known to have made good gains during the first year or eighteen months of their lives, that knowledge might be a more reliable indication of the rate of gain that might be expected from calves out of the herd than any information that is now being used in cattle selection. In 1932, Winters and McMahon[1] demonstrated at the Minnesota Experiment Station that rate of gain is a reliable indication of feed requirement per 100 lb. gain. In other words, generally the fast-gaining animal will also be efficient in feed utilization.

Bulls used as sires in feeder cattle-producing herds are generally purchased from purebred breeders, or in case of large ranch establishments they are often produced in smaller purebred herds maintained by the rancher. In either case, it would be of value if the rate of gain to twelve months old for such bulls could be known, and it should be of value to the breeders of purebred beef cattle to have a record of the weight at twelve months old of all calves produced in the herd. That it would pay to keep individual feed-consumption records even on purebred calves is doubtful.

The form that follows, prepared jointly by the Animal Husbandry Division of the U.S. Department of Agriculture and the Minnesota Experiment Station,[2] indicates the data that might be kept by any beef-cattle breeder and used as an aid in selection.

[1] Efficiency Variation in Steers, *Minn. Agr. Expt. Sta. Tech. Bul.* 94, 1933.

[2] Mimeograph Report, *A.H.D.* No. 37, U.S. Department of Agriculture, Washington, D.C., 1941.

Animal No.________Sex________Birth date________Birth weight________

PERFORMANCE RECORD

Birth to Weaning	After Weaning
Date weaned__________	Date finished__________
Age at weaning__________	Age__________
Weight at weaning__________	Final weight__________
Total gain__________	Total gain__________
Daily gain__________	Daily gain__________
Score at weaning__________	Score at end of test__________

It is recommended that if possible an individual feed record be kept and included with the preceding data. It may be taken for granted, however, that such an individual feed record will seldom be available. The final valuation will be based on the following performance data: (*a*) gain during nursing period, (*b*) gain during feeding period, (*c*) merit score, and (*d*) feed per 100 lb. gain if available.

If such information concerning young purebred bulls were available, not only would it be of value to the producer of feeder cattle in purchasing bulls but it would be of value to him in selling the feeder calves from his herd. The fact that the calves were sired by a bull known to have been a rapid gainer as a young calf and out of cows that were known to have been rapid gainers as young heifers would be a better indication that feeder calves out of the herd would be rapid and efficient gainers than any criterion now available.

Selecting Breeding Animals.—The selection of breeding cattle is to a very large extent based on the same requirements in appearance as in the case of market animals. Since calves that are to be retained for use as sires and brood cows must, for economic reasons, be selected before they have reached maturity, it is necessary that the judge base his selection on what will be the probable appearance of the young animal at maturity rather than on its immediate appearance. Since so many factors enter to influence the appearance of young cattle through their growing period, the most expert judges find it difficult to select breeding stock with a high degree of accuracy on the basis of appearance alone.

Selection Based on Ancestry.—The most successful breeders have supplemented selection based on appearance by every available means. The most readily available knowledge that

may serve as such a supplement is knowledge of the merit of the immediate ancestors. Calves sired by a good bull out of good cows are more likely to grow up to be good cattle than are calves sired by an inferior bull out of inferior cows. Calves backed up by several generations of ancestry, all of which were known to be good cattle, are more likely to grow up to be good cattle than calves whose ancestry through several generations back was known to be inferior.

Selection Based on Progeny.—The progeny test, when progeny is available, is a still more reliable supplement to selection based on appearance than the ancestry. Because of the short life span of beef cattle, the progeny test generally is used to advantage, principally by the established breeder. It is so seldom that a thoroughly proved sire or brood cow is offered for sale that a beginning breeder can rarely buy such animals at a reasonable price.

Selection Based on Show-ring Winnings.—Show-ring winnings have been used as a basis in selecting breeding cattle with which to start or supplement purebred herds to a greater extent than is the case with any other kind of animal. This is probably true, at least partly, because success in beef production depends to a larger extent on production of the correct type of animal than is the case with other kinds of farm animals. The show ring has been instrumental and quite successful in keeping before breeders of beef cattle the most useful type of animal to produce. The show ring, therefore, has been a safe guide to the beginner or the uninformed breeder as to the place to go to secure breeding animals that would prove most valuable in his herd.

The failure of an occasional animal with a record of extensive show-ring winnings to become a successful breeding animal has been cited to condemn the show ring as an aid in the selection of purebred beef cattle. These instances are the exception rather than the rule, however, and the show ring still stands as one of the best available aids in selecting purebred breeding cattle of the beef breeds.

Selection Based on Performance.—As demonstrated in the breeding of dairy cattle, race horses, and poultry, performance records are a valuable aid to selection, even after all other available guides have been used. It will never be practical to keep extensive performance records for even purebred beef cattle

because of the high cost of keeping such records contrasted to the value of the individual animal. The keeping of such simple records as the weight and score of the calf at twelve or eighteen months of age, however, promises to serve as a reliable, worthwhile aid to the buying public and should be given a trial by purebred registry associations. Such records might be collected under the supervision of the registry associations, published, and distributed in much the same manner as the milk and butterfat records of dairy cows are collected, published, and distributed by the dairy associations.

Questions

1. Explain the use and purpose of the score card in teaching livestock judging.

2. Why is the score for the fat steer used as the standard in beef-cattle judging?

3. What is meant by comparative judging?

4. What is the value of comparative judging practice to the beginner in studying livestock judging?

5. Why are classifying and grading important in dealing in animals?

6. What factors determine the value of a feeder steer?

7. Why would performance records be of value in the purchase of feeder animals?

8. What kind of performance record has been recommended for beef cattle?

9. What aids to judging by observation are commonly used in selection of breeding animals?

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CHAPTER XIII

MARKET CLASSES AND GRADES OF CATTLE

The classifying and grading of cattle is used as a measuring stick on which both buyer and seller may base valuations. It is used as the vocabulary in market reporting. It serves as a guide to producers in shaping their production to meet the market demand. It serves as a standard to ensure fair dealing when cattle are purchased by order without being seen by the buyer. It has served to promote uniform practices in dealing and uniform prices for cattle of similar class and grade on the larger markets, where a number of commission firms and a number of buyers are doing business daily. In shaping a set of market classes and grades of cattle, the class is determined by the use that is to be made of the animal and the grade by how well the animal fulfills the requirements for its class. A useful set of market classes and grades must be quite complicated and complete.

Workers in the Bureau of Agricultural Economics of the U.S. Department of Agriculture have been investigating and studying every angle of market classification and grading of livestock through the last twenty-five years. The first set of classes and grades for cattle recommended by the Bureau of Agricultural Economics in 1922[1] was based on the class and grade divisions and terms then in most common use on the large central markets. Changes in classes and grades and, especially in the terminology setting forth the limitations of each, have been made from time to time to improve weaknesses that have been observed.

The Market Classes.—The following outline shows that the first step in the classification of market cattle is the division into two groups, cattle and calves.

Cattle:	Calves:
Slaughter cattle	Vealers
Stockers and feeders	Slaughter calves
Milkers and springers	Stocker and feeder calves

[1] Market Classes and Grades of Cattle, *U.S. Dept. Agr. Bul.* 1464, 1927.

This division is based on age. All members of the bovine family are called "calves" until they reach the age of one year, after which they are designated "cattle." The cattle group is then divided into three classes: slaughter cattle, including all cattle sold for immediate slaughter; stockers and feeders, including those sold to be grown for a time or fattened; and milkers and springers, including those cows recently freshened or soon due to calve, sold for use as dairy cows. The calf group is also divided into three classes: vealer calves, including those calves that have been fed only on milk and that are sold for immediate slaughter; slaughter calves, including all calves that have received feed besides milk but that are sold for immediate slaughter; and stocker and feeder calves, including those sold to be grown or fattened. The veal calf is composed largely of the younger, smaller calves under three months old, the slaughter-calf group, those somewhat older and heavier, and the stocker and feeder calves, those that have reached a weaning age and that are ready to go on a growing or fattening ration.

The Subclasses.—The following outline shows how the six market classes of cattle and calves are divided into subclasses based on the sex condition of the animals. No subclasses are indicated for vealers because at the early age at which they are slaughtered, the development of sex characteristics has made so little progress that it has no noticeable affect on the carcass.

Slaughter cattle:
- Steers
- Heifers
- Cows
- Bulls
- Stags

Stockers and feeders:
- Steers
- Heifers
- Cows
- Bulls

Milkers and springers:
- Milkers
- Springers

Vealers:
- No subclasses

Slaughter calves:
- Steers
- Heifers
- Bulls

Stocker and feeder calves:
- Steers
- Heifers
- Bulls

Further division of the several market subclasses is often made in dealing and in market reporting. Cattle falling within a

subclass may be further divided according to age or weight or both. In market reporting, quotations are always given according to market subclass or sex condition and according to age and weight for those subclasses in which a wide range in age and weight may affect the suitability of the animal for the purpose it is to serve. In dealing, slaughter steers are commonly divided into two age groups, yearlings and two-year-olds or over. This age grouping applies also to slaughter heifers, slaughter bulls, and stocker and feeder steers and heifers. Each subclass and age group is then commonly divided into two or three weight groups, the weight range often being specified by stating the range in weight allowed, though sometimes the terms "light," "medium," and "heavy" are used without giving the range in pounds. Stating the age grouping or the weight grouping or both in preparing a market report is necessary only on those subclasses in which the approximate age or the approximate weight of the animal will influence the price.

After cattle have been divided into groups, classes, and subclasses according to the immediate purpose they will serve to best advantage, as determined by their sex, condition, approximate age, and weight, these groups are graded or divided still further on the basis of the degree to which they fulfill the requirements of their group, class, and subclass. To indicate the grade, the same list of terms is used for all classes and subclasses, except that different terms are used for the highest and for the lowest grades of slaughter and stocker and feeder cattle.

The Market Grades.—In grading live cattle on the markets, the following list of terms, to distinguish the several grades, is in general use throughout the United States.

Slaughter Grades	Stocker and Feeder Grades
Prime	Fancy
Choice	Choice
Good	Good
Medium	Medium
Common	Common
Cutter	Inferior
Canner	

Conformation, finish, and quality are the factors that largely determine the grade or degree to which an animal fulfills the requirements of its class. In the slaughter classes, finish, form,

and quality are of importance in the order given. In the stocker and feeder classes, form is of the greatest importance, quality next, and finish is unimportant. The object of grouping cattle by grades for selling is to get them into groups of sufficient uniformity so that all animals in the group have so nearly the same utility value that they can be equitably sold or purchased at the same price per pound. A general statement of the limitations of each grade is presented in the following paragraphs; however, it is impossible to describe the limitations of each grade with sufficient clearness to equip the reader to start right out grading cattle accurately. Grading requires drawing distinctions so narrow that only after considerable practice under guidance and instruction by an expert can one hope to become proficient in this final task in the classification and grading of cattle.

Grade Description of Slaughter Cattle.—The following descriptions give some idea of the requirements of the several grades of slaughter cattle.

Prime.—To grade prime, the slaughter steer, heifer, or calf must be nearly perfect in finish, form, and quality. This means an animal that is deep and wide in body, thickly covered with muscle throughout, thoroughly fat, very smooth, fine in bone, and firm to the touch in flesh covering. Very few cattle are good enough in all the requirements to grade prime. Cows, stags, and bulls are never graded so high as prime.

Choice.—To grade choice, any beef animal must be nearly as good in all respects as the prime animal. The choice grade permits slight defects in form and quality but requires that the animal have a thick covering of muscle and be thoroughly fat, smooth, fine in bone, and firm in texture of flesh. The percentage of all slaughter cattle possessing sufficient merit to grade choice is also low.

Good.—Cattle of any of the slaughter classes may be graded as high as good. Animals placed in this grade will not appear quite so wide or thick in flesh covering and may not be quite so fat, smooth-appearing, or fine in bone as those of choice grade. They must be quite thick in muscle covering, quite fat, and fairly even in covering. A considerable percentage of grain-fed cattle and some grass-fat cattle of beef breeding fall in this grade.

Medium.—The medium slaughter animal begins to show a lack of thickness in muscle covering, is generally not quite fat

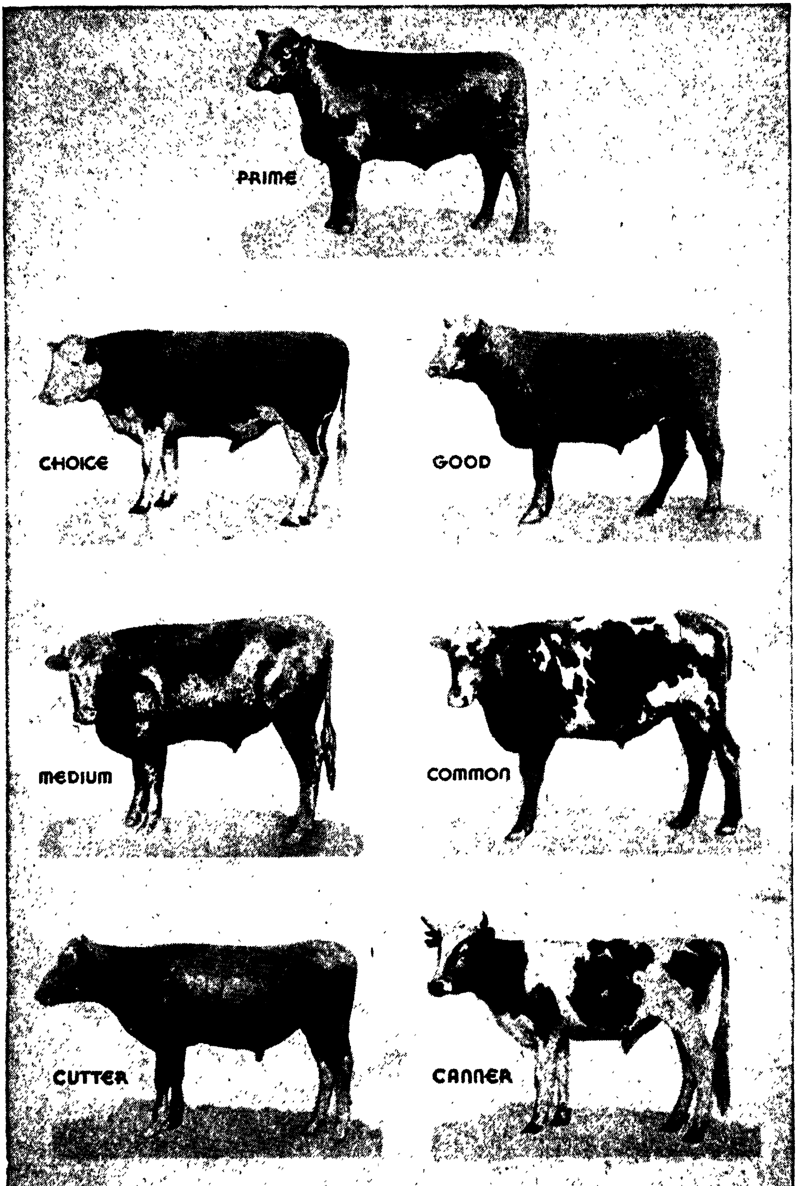

FIG. 27.—The market grades of slaughter steers. (*Courtesy U.S. Department of Agriculture, Agricultural Marketing Service.*)

enough, and consequently appears narrower and shallower in body than is desirable. He may be lacking somewhat in all requirements but must not be decidedly weak in any important character.

Common.—The common slaughter animal is lacking in form, finish, and sometimes in quality but must still be good enough so that the entire carcass can be sold over the retail meat counter.

Cutter.—Those animals so poor in form and lacking in muscle and fat covering that only such wholesale cuts as the loin and round can be sold over the retail meat counter are graded cutters. Those parts of the carcass not usable as wholesale cuts are boned and used in sausage and in canned-meat products.

Canner.—The extremely inferior cattle so lacking in flesh covering that practically none of the wholesale cuts can be merchandised over the retail meat counter are designated canners.

Grade Description for Stocker and Feeder Cattle.—Stocker and feeder cattle are graded on the basis of conformation, quality, and amount of fat they carry in just the same way that slaughter cattle are graded. Except for the highest and the lowest groups, the same terms are used. Since the term "prime" conveys the idea of something that has been made just about as good as it can be, it would be misleading to apply it to feeder cattle, which still need to be fattened before they can be considered as good as they can be made. "Fancy" has been substituted to indicate the highest grade of feeder cattle. Since the terms "cutter" and "canner," used for the lowest grades of slaughter cattle, indicate that the animals are to be slaughtered, they likewise are not suitably applied to feeder cattle that are to be fattened before being slaughtered. The term "inferior" has been substituted to indicate the lowest grade of stockers and feeders.

Fancy.—To grade in the highest possible grade, "fancy," a feeder steer or heifer must be nearly perfect in every requirement of beef form, must be deep and fairly wide in body, short in neck, short and broad in head, low-set, deep in fore- and rear flanks. thickly covered with muscle, reasonably fine in bone, symmetrical in appearance, and show by its breed characteristics that it is a purebred, crossbred, or high-grade animal of the beef breeds. The fancy feeder must show thrift and good health and be ready to go right into the feed lot to be brought up to a full feed of grain in a short time. Very few feeder cattle are sufficiently excellent

in all the requirements to grade as fancy. The fancy feeder should make a finished animal that will grade prime after being fattened.

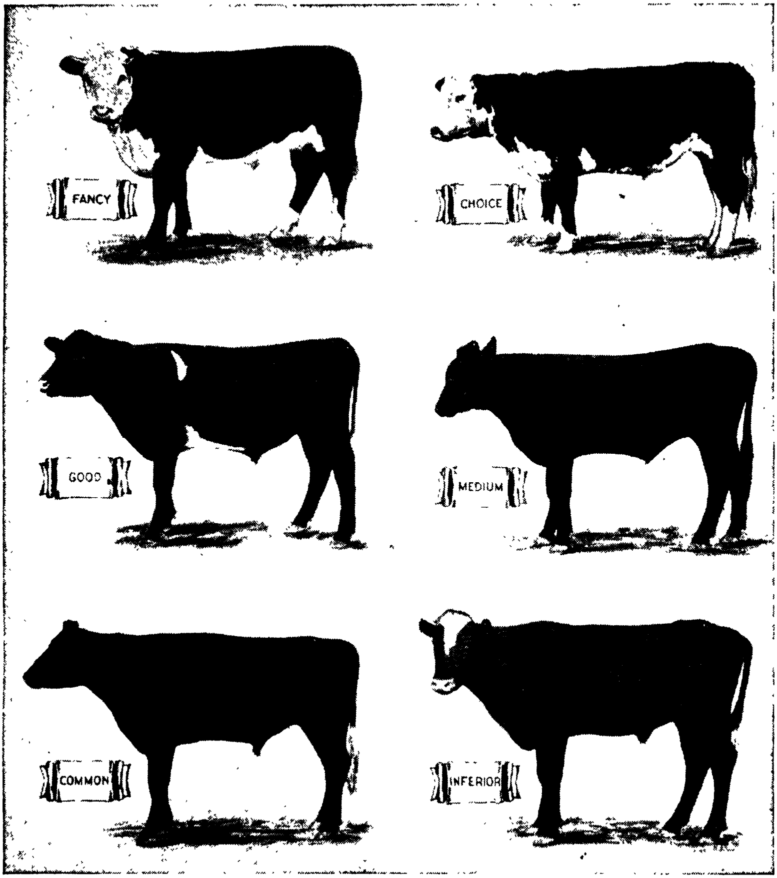

FIG. 28.—The market grades of feeder steers. (*Courtesy U.S. Department of Agriculture, Agricultural Marketing Service.*)

Choice.—The choice feeder may show minor deficiencies in form and lack a trifle in quality but must be deep in body, thickly covered with muscle, deep in fore- and rear flanks, reasonably short in neck, and short and broad in head. The choice feeder must carry sufficient flesh and show such good thrift that it is ready to go right into the feed lot and start on a fattening ration. The choice feeder must show color and breed character-

istics of the beef breeds. Choice feeders should make choice slaughter cattle after being fattened. Only a comparatively small percentage of all feeder cattle are good enough to grade as choice.

Good.—The good feeder lacks noticeably in form and quality as compared to a choice feeder. To grade "good," stockers or feeders must still show good depth of body, some muscle covering, be reasonably low-set and thrifty in appearance, and show evidence of a preponderance of beef breeding. Good feeders may be quite thin and may be lacking in any evidence of fat already formed in their tissues. The feeder of good grade should grade a good slaughter animal when fat. Feeders that were graded good rather than choice partly because of their extremely thin condition may get into the choice grade of slaughter cattle if they are kept on feed long enough to become fully fat. A rather high precentage of cattle showing a predominance of beef breeding when marketed as feeders classify into the grade of good.

Medium.—The medium feeder is generally quite noticeably deficient in form and quality but carries an appreciable amount of muscle covering and is fairly deep in body. The medium feeder shows evidence of some beef breeding and is often graded medium rather than good principally because it is extremely thin in flesh. Many medium feeders are light in weight for their age and, if carried for a time as stockers before being put in the feed lot and are then made fully fat before being returned to market, will grade as good rather than medium slaughter cattle.

Common.—As the term indicates, common feeders are animals somewhat deficient in practically all the requirements of a desirable feeder animal. They generally show evidence of mixing of beef and dairy breeding, with the dairy characteristics predominating. Some steers and heifers of pure or nearly pure dairy breeding are classed as common feeders. They are generally quite thin in flesh. By putting enough fat on the common feeder, his grade may sometimes be raised to the grade of medium when he is returned to market as a slaughter animal.

Inferior.—Although the grade of inferior feeder is listed, few cattle so lacking in merit as to be graded inferior are sold as feeders. The majority go as slaughter cattle of the cutter and canner grades. Occasionally, when feeder cattle are extremely scarce and high in price, some cattle fatteners will buy young cattle grading as low as inferior and put them in the feed lot,

hoping to secure a profit from fattening them because of the low price at which they are purchased as feeders. Most inferior feeders are of dairy breeding.

Deviation from Standard Classes and Grades.—The classes, subclasses, and grades for market cattle as stated and described are recommended by the Agricultural Marketing Service of the U. S. Department of Agriculture for use every place in the United States where cattle are bought and sold.[1] At the time this standard set of classes and grades was first recommended, it must be remembered that there were sets of classes and grades in use on all markets. The terminology and limitations for the various classes and grades differed widely among markets. To abandon some of the long-established terms and descriptions and replace them with the new ones has not been easy for those engaged in the trade on the various markets. The standards have, however, been given general approval, and the principal deviations from them now consist of the use of some additional terms to indicate more clearly to a local trade the description and characteristics of certain types of cattle peculiar to the locality.

A Typical Market Report.—Table IX is a copy of a cattle-market report taken from a daily paper published in a large city in which a large livestock market is located.

TABLE IX.—CATTLE QUOTATIONS
Slaughter Cattle—Vealers and Calves

Steers:	
Choice, 750–900 lb	$10.50–$11.75
Choice, 900–1,100 lb	10.25– 11.50
Choice, 1,100–1,300 lb	10.25– 11.50
Choice, 1,300–1,500 lb	10.00– 11.25
Good, 750–900 lb	9.50– 10.50
Good, 900–1,100 lb	9.25– 10.25
Good, 1,100–1,300 lb	9.25– 10.25
Good, 1,300–1,500 lb	9.00– 10.00
Medium, 750–1,100 lb	8.50– 9.50
Medium, 1,100–1,300 lb	8.50– 9.50
Common, 750–1,100 lb	7.50– 8.50
Heifers:	
Choice, 750–900 lb	$10.00–$11.00
Good, 750–900 lb	9.00– 10.00
Medium, 500–900 lb	8.00– 9.00
Common, 500–900 lb	7.00– 9.00

[1] Market Classes and Grades of Cattle, *U.S. Dept. Agr. Bul.* 1464, 1927.

TABLE IX.—CATTLE QUOTATIONS.—(*Continued*)

Slaughter Cattle—Vealers and Calves

Cows:	
Good, all weights	$ 7.75–$ 8.50
Medium, all weights	7.25– 8.00
Cutter, all weights	6.00– 7.25
Low cutter, all weights	5.00– 6.00
Bulls (yearlings excluded):	
Beef, good, all weights	$ 8.25–$ 8.50
Sausage, good, all weights	8.00– 8.50
Sausage, medium, all weights	7.50– 8.00
Sausage, cutter, all weights	6.50– 7.50
Vealers:	
Good and choice, all weights	$10.00–$12.00
Common and medium, all weights	7.50– 10.00
Cull, all weights	5.00– 7.50
Calves:	
Good and choice, 400 lb. down	$ 8.00–$ 9.50
Common and medium, 400 lb. down	6.50– 8.00
Cull, 400 lb. down	5.00– 6.50
Stocker and Feeder Cattle and Calves	
Steers:	
Choice, 500–800 lb	$10.00–$11.50
Choice, 800–1,050 lb	9.75– 10.75
Good, 500–800 lb	9.50– 10.50
Good, 800–1,050 lb	9.25– 10.00
Medium, 500–1,000 lb	8.00– 9.25
Common, 500–900 lb	7.00– 8.00
Heifers:	
Medium to good, 500–750 lb	$ 7.25–$ 9.00
Cows:	
Medium to good, all weights	$ 5.75–$ 7.00
Calves (steers):	
Medium, 500 lb. down	$ 8.75–$10.50
Calves (heifers):	
Medium, 500 lb. down	$ 7.50–$ 9.00

Thirty-nine citations of market class, subclass, and grade groupings, with price range for each prevailing for the day on the market being reported, are given. Even then, it is by no means a complete citation of all the class, subclass, and grade groups that might appear on any large market in the course of a day's trading. It is complete enough to cover all of the classes and grades of cattle being marketed on this specific market in significant numbers at the time. Anyone familiar enough with the requirements of the various classes and grades so that he could accurately

classify and grade the cattle he has to sell could easily locate their class and grade in the list and note the price range within which they would be most likely to sell if delivered to that market within the next day or two. Only one or two minor deviations from standard class and grade terminology are used in this entire market report. The use of the terms "beef" and "sausage" in the classification of slaughter bulls and the indication of the lowest grade of vealers and calves as cull are additions to the standard terminology.

Questions

1. State the uses made of market classes and grades of cattle.
2. What determines a market class? A market grade?
3. How was the first set of classes and grades recommended by the U.S. Department of Agriculture developed?
4. What is the dividing line between the terms "cattle" and "calves," as applied to animals of the bovine family?
5. Name the six market classes of cattle and calves.
6. What is the basis for dividing the classes into subclasses?
7. Name the subclasses for each market class.
8. What is the significance of age and weight in the market classification of cattle?
9. Name the market grades of slaughter cattle and calves; the stocker and feeder grades.
10. What characteristics of cattle form the basis for grading?
11. What information is essential in a useful market report?

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SECTION III

Dairy Cattle Production

CHAPTER XIV

PRODUCTS AND ADAPTATIONS OF DAIRY CATTLE

Milk is the principal product of dairy cattle. Beef and veal are properly considered by-products. Less than one-half of the total supply of milk is used for direct consumption. Butter, cream, and cheese resulting from simple processing of milk are in practice considered primary products of the dairy cow, as are ice cream and the several condensed-milk products resulting from more complex processing.

Just when man began to use milk as food for himself is not known. Neither is it known when butter and cheese were first made. Earliest writings indicate that milk was used as whole milk and that butter and cheese have been made for many centuries. Ice cream and the condensed-milk products are of more recent origin.

Skim milk, buttermilk, and whey are by-products of considerable significance resulting from separating cream, from buttermaking, and from cheese making, respectively. Cottage cheese, dried skim milk, dried and semisolid buttermilk, casein, and lactose are additional by-products of growing importance. A number of chemical products of lesser value and limited use, such as albumin and lactic acid, are made from milk or from the by-products resulting from the processing of milk. All products of the dairy cow may be grouped as

1. Whole milk and products manufactured directly from it.
2. Sweet cream and products made from it.
3. Butter.
4. Cheese.

The by-products may be grouped as

1. Skim milk, buttermilk, whey, and products made from them.
2. Beef and veal.

The total annual per capita consumption in the United States of all dairy products expressed in terms of milk varies around 800 lb. or 90 to 95 gal.[1] Divided according to the several major products, the consumption is as follows:

Whole milk	38–40 gal.
Butter	16–17 lb.
Cheese	5– 6 lb.
Evaporated milk	16–17 lb.
Condensed milk	2 lb.
Ice cream	2 gal.

To produce this supply of milk, about 25,000,000 cows are maintained primarily for milk production.

Milk and Milk Products.—Milk as it comes from the cow's udder is a valuable food product. It is suited for direct consumption except that it must be cooled to a low temperature (35 to 40°F.) and kept cool until used if it is to remain sweet and palatable. Whole milk normally contains from 12 to 14 per cent solids and 86 to 88 per cent water. The solids are in solution or suspension so that milk is consumed as a beverage. The solids include 3 to 6 per cent fat, 4 to 5 per cent milk sugar, 3 to 4 per cent protein compounds, and a little less than 1 per cent mineral compounds. Whole milk contains moderate amounts of several vitamins. Because of the wide variety of the nutrients it contains and their high digestibility, milk is a wholesome, healthful food. It is especially valued as a food for infants and growing children. It is no less desirable for adults except that the high water content makes it a bulky food. Although most persons enjoy the taste of milk, it is not palatable to some.

Families living on farms have for many decades been extensive consumers of milk. Many urban families do not consume as much milk as they should, principally because by the time it is distributed to homes in cities and towns it often becomes a high-priced food. Improved sanitation and handling of milk distribution have raised it from a rating as one of the least sanitary of foods fifty years ago to one of the most sanitary and safest of all

[1] Estimates from *U.S. Bur. Agr. Econ. Statistical Report*, 1939.

foods from the standpoint of wholesomeness and health at the present time.

Evaporated Milk.—Evaporated milk is the name applied to milk from which a part of the water has been driven off by applying heat to it. The moisture content is reduced to about 75 per cent. It is then placed in airtight sealed cans. The object of producing evaporated milk is to put it in condition to keep longer, reduce its bulk, and thus make available a product similar to whole fresh milk in locations and under circumstances where whole fresh milk could not be supplied at all or only at high cost. It is used as it comes from the can for drinking, on cereals and desserts, and in baking and cooking.

Condensed Milk.—Condensed milk is milk with the moisture content reduced to a much lower percentage than evaporated milk. The moisture content of condensed milk is around 32 per cent. Condensed milk generally has sugar added to it to the extent of about 40 per cent. It is also put in airtight cans. If used for drinking, condensed milk is first "reconstituted" by adding water to it to give it about the same proportion of water to solids as whole milk. It will keep longer than evaporated milk but is less desirable in taste. It is used largely in candymaking and baking.

Dried Milk.—Dried milk is milk from which nearly all the water has been driven off. Its normal moisture content is 5 per cent. After drying, it is ground to a fine powder and packaged in strong paper bags, if for early use, or in vacuum airtight cans if it is to be kept an indefinite period. By adding water to dried milk, it may be reconstituted to resemble closely fresh whole milk in all characteristics except taste. Reconstituted dried milk always has a heated, stale taste and lacks the flavor of fresh milk. It is used to some extent as milk to drink but is used more extensively in cooking, baking, and candymaking.

The principal objective in processing evaporated, condensed, and dried milks is the reduction of the moisture content to make a product more suitable for use in cooking and baking, where the milk solids are wanted and where the taste is covered by other flavoring ingredients. Processing lengthens the period of time for which milk may be kept in a good state of preservation and reduces the bulk for handling and transportation. It is a means

of utilizing surplus milk during flush seasons and preserving it for use later, when the supply is short.

Cream and Ice Cream.—When whole milk is allowed to stand, the fat globules rise to the top in a thick viscous layer. In early times this was given the name "cream." It was the custom to skim the cream from the milk with a large spoon and use it as a food. The taste of sweet cream is relished by nearly everyone. It is used on breakfast foods, on many desserts, in coffee and tea, and on other foods to add flavor and richness to them. It is also used in cooking and baking.

Cream is now separated from fresh milk soon after milking by the mechanical device known as the "cream separator." The first cream separators appeared in Sweden and Denmark about the year 1878.[1] Their use has since spread throughout the world. They are used on nearly every farm in the United States where as many as three or four cows are milked. The richness or percentage of fat in cream can be regulated in mechanical separation. The percentage of fat usually runs somewhere between 20 and 35 per cent. Cream of the lower fat content is preferred for use in coffee and tea and on breakfast foods. Cream of the higher fat content is necessary for whipping and is preferred on desserts. Small amounts of cream are condensed or dried and marketed in sealed cans.

Ice Cream.—It is known that ice cream has been used as a food for several centuries. Its extensive use is of more recent development and is due to recently improved methods of making, flavoring, packaging, distributing, and using it. The making and distributing of ice cream commercially is a complex process involving large factories, complicated machinery, and highly developed distribution systems. The basic ingredient in its composition is cream or butterfat, though the percentage of butterfat in ice cream is much lower than the average uninformed person would suspect. Seldom does commercial ice cream contain more than 20 per cent butterfat, and much of it runs below 10 per cent. An average would probably be somewhere between 10 and 12 per cent. The remainder of the solid matter in ice cream is made up of the other milk solids contained in the cream, sugar added in making it, small amounts of various flavoring

[1] PETERSEN, W. E., "Dairy Science," p. 551, J. B. Lippincott Company, Philadelphia, 1939.

materials, and small amounts of various other materials that contribute certain desirable characteristics to ice cream. The total dry-matter content of ice cream, including butterfat, is usually about 40 per cent. The remainder is water.

Butter.—Of all products made from milk, butter is probably the most universally used and liked. Butter is highly concentrated cream or cream with most of the water and milk solids other than fat eliminated from it. Typical butter contains about 82 per cent fat, 15 per cent water, 2.5 per cent salt added to give it flavor and as a preservative, and traces of other milk solids not eliminated in churning and washing. Not so many years ago most of the butter consumed in the United States was made on farms in small hand churns and distributed in numerous forms of containers. It is within the last 100 years that the transition of buttermaking from the farm home to the modern creamery or butter factory has taken place. This transition was brought about largely by the invention of the cream separator, making possible immediate separation of cream following milking and prompt delivery of the cream in sweet, wholesome condition to the near-by creamery. Much butter is still made from cream collected over periods of several days on farms, then delivered as sour cream to creameries sometimes located a long distance away so that the cream is shipped by rail.

Because of its high palatability or tastiness and because of its richness or high nutritive value, butter is eaten in small quantities as a spread on bread and other food products. It is also used extensively in cooking and baking. Modern sanitation in its production and processing and the use of refrigeration in storing, in transportation, and in keeping it in the home has converted butter from a highly perishable to a semiperishable product and greatly increased its consumption in all civilized countries. This transition has taken place in the last 100 years, largely in the last 50 years. The United States has been one of the leading countries of the world in this development, with the result that nearly every person in this country may now enjoy the highly prized flavoring effect of butter when combined with many other foods as well as its highly nutritious health-giving qualities.

Cheese.—Cheese is thought to have been one of the first products to be made from milk. This may be explained by the fact that other than the modern canned-milk products it is the

least perishable or will keep longer under natural methods of preservation than any other milk product. Cheese making has been developed in many countries through a long period of time. As a result, modern invention and modern ingenuity have contributed little by way of improvement or new methods of cheese processing.

There are many kinds of cheese. For some of them variety or trade names are of long standing, such as Roquefort, Swiss, Cheddar, and Limburger. Cheese is generally made from whole milk, but it may be made from skimmed milk, cream, or even whey. There are many different methods of procedure in cheese making. Nearly all of them have several features in common. These include curdling the milk, heating the curd, draining off the whey, pressing the cheese, and curing. Nearly all kinds of cheese must pass through a curing or aging period of at least 3 months. Many are aged from 6 months to a year before being marketed.

Different kinds of cheese differ widely in composition, depending mostly on whether they are made from whole milk, cream, or skim milk. A typical composition of a whole-milk cheese would be 30 per cent fat, 24 per cent protein compounds, 2 per cent salt, added for flavor and preservation, and 40 per cent water. A normal yield of milk in cured cheese is from 10 to 12 lb. of cheese per 100 lb. of milk. Different kinds of cheese vary widely in flavor. Some are mild and some very high in flavor. People vary widely in their liking for various cheese flavors. Some like mild flavors, some the strong flavors, and some do not relish any kind of cheese. Although no new processes for cheese making have been developed in recent years, much knowledge concerning the chemical and bacterial actions that occur during the curing period has been gained, with the result that cheese quality has been markedly improved and consumption of cheese increased. Cheese making offers an outlet for milk during seasonal periods of oversupply.

The By-products of Milk.—Skim milk resulting from separating the fat or cream from whole milk, buttermilk resulting from the churning of butter from cream, and whey resulting from the curdling and draining of cheese are considered as by-products of milk.

Skim Milk.—Most skim milk remains on the farm where it is used as feed for calves, pigs, and poultry. The dairy farmer is

often advised to raise enough hogs to supplement the calves in utilizing all the skim milk produced. Some skim milk is used for drinking in place of whole milk. In recent years some skim milk has been dried and is used in poultry feeds, calf meals, swine feeds and is also sold for cooking, baking, and candymaking.

As a feed for livestock, skim milk has a value about one-fifth the value of such grains as corn, wheat, barley, and oats, pound for pound. It serves satisfactorily as a protein supplement in the swine and poultry rations and may be satisfactorily substituted for whole milk in calf feeding after calves are one to two months old.

Buttermilk.—Most of the buttermilk is now produced at commercial creameries. As feed for hogs and poultry, buttermilk has the same uses and about the same value as skim milk. It is not so well suited to calf feeding. A great deal of buttermilk is now condensed and sold in barrels as semisolid buttermilk or dried and sold in paper sacks. The semisolid and dried products are then used principally as livestock feeds.

Whey.—Whey is lowest in solids and highest in water content of all of the milk by-products. As fresh whey it may be fed to hogs or poultry but has a low feeding value, not only because its water content is high but because nearly all the protein as well as the fat has been removed from it. It therefore cannot be used as a protein supplement. An average composition of whey is 93.4 per cent water, 0.7 per cent ash, 0.8 per cent protein, 4.8 per cent nitrogen-free extract, and 0.3 per cent fat.[1]

Casein and Lactose.—These are two products often manufactured from skim milk and whey when there is no other way of securing a return from the raw products. Casein is made from skim milk, and lactose or milk sugar is secured chiefly from whey. Both products have a number of uses in manufacturing processes, but securing them is still so expensive that few creameries or cheese factories are able to make their production profitable.

Beef and Veal from Dairy Cattle.—The contribution of dairy cattle to the supply of beef and veal is discussed in the section on Beef Production (pages 89–90). The fact that bulls no longer useful as herd sires and old cows, as well as cows whose udders have been injured and cull cows, can be marketed on the beef

[1] MORRISON, F. B., and W. A. HENRY, "Feeds and Feeding," p. 713, The Henry Morrison Company, Ithaca, N.Y., 1923.

markets adds appreciably to the income of the dairy farmer. In times of high prices for beef, young dairy bulls and heifers of the larger breeds of dairy cattle are often grown to the yearling age, fattened, and marketed as beef with larger profit than when the calves are sold as veal. In the United States the dairy industry contributes about 20 per cent of the annual beef supply.

Since cows normally do not reach their time of largest milk production until about seven years old, it is the practice of dairymen to keep most cows to the age of ten to twelve years. This results in the production of many more calves in dairy herds than are needed for replacements. In all except the better purebred herds it is common practice to sell the surplus calves as veal when from six weeks to two months old. About 9,000,000 veal calves are slaughtered annually. Practically all of them are produced by dairy cows. The entire veal supply is therefore contributed by the dairy industry and makes a major contribution to the income of dairy farmers.

The Adaptations of Dairy Cattle.—Dairy cattle are adapted to successful production under a wide range of climatic and environmental conditions. For many years the perishable nature of dairy products made it necessary that dairy herds be maintained near the consumer market so that the product could be delivered to the consumer before it had time to spoil. This was especially necessary in the production of whole milk and sweet cream for table use. Butter was less perishable, and farms producing butter or cream for making butter could be located somewhat farther from the consuming center. Cheese, the least perishable of all the dairy products, was made on farms located advantageously for production with less regard for nearness to market.

So many improvements in handling and distributing all dairy products have been made during recent years that all of them are now less perishable than formerly. Distance from the consumer is now a much less important factor, and suitability of the farm to economic production is a much more important factor than formerly in determining the location of the dairy farm. The cooling of milk soon after it is drawn from the cow, pasteurization, bottling, and keeping it at low temperatures by the use of ice and refrigeration are the practices responsible for checking bacterial growth and extending the keeping quality of whole milk and sweet cream. The production of the motor truck and the exten-

sive building of good roads made possible the economic and quick collection of milk and cream and delivery to the consumer over distances extending to 100 miles or more. As a result of the combined influence of the two developments, the whole scheme of producing and distributing whole milk has changed during the last 25 to 40 years.

The Local Dairy Farm.—Formerly whole milk for city and town use was produced on farms, generally of small acreage, located within a maximum distance of about 4 miles from the edge of the city. The milk produced by each dairy farm was delivered directly to the residence of the consumer by the operator of the farm. Often most of the feed used for the cow herd was purchased, because the high price of land so close to the city made it unprofitable to use it for growing feed. Cows were usually purchased as springers or fresh cows, for it was too expensive to raise calves on the high-priced land. A few such specialized milk farms have been able to continue in business, especially to supply small towns where land adjacent to the towns is not so high priced so that larger farms may be owned and a breeding herd maintained. This is still the method by which towns up to about 15,000 population are supplied with milk and cream for table use, because in towns of 15,000 or less the volume of business is not large enough to warrant a specialized distributing enterprise. Such local dairies have modernized their production, handling, and distribution methods, however, so that most of them deliver pasteurized milk of quality equal and in many cases superior to that delivered by distributing companies in large cities. Many of them sell skim milk, butter, buttermilk, and cottage cheese to patrons who wish to buy these products. The making of such products offers an opportunity to the local dairy to utilize surplus milk to the best advantage. Many also maintain excellent herds of purebred dairy cattle.

The Market Milk Dairy.—The milk and sweet cream used in large cities is now produced on farms for the most part located within a radius of 50 miles of the city, though a few milksheds extend as far as 200 miles out in some directions. The term "milkshed" is used to designate the area from which a large city secures its whole-milk and sweet-cream supply. Dairy farms producing this milk simply cool it, put it in 10-gal. cans, and deliver it in various ways, largely by truck, to distributing

companies or cooperative distributing agencies in the cities where it is pasteurized, bottled, sometimes standardized for fat content, and distributed to the consumer. Some of the farms producing this "market milk," as it is called, also breed high-grade or purebred dairy cattle.

The Farm Producing Cream for Buttermaking or Milk for Cheese Making.—In the early development of dairying, butter was made on the farms on which the milk was produced. Some farmers had customers in the towns and cities to whom they supplied butter, usually at weekly intervals. Others sold their butter to grocery stores, which, in turn, sold it to their customers or collected it and sent it on to butter markets in larger cities. The first progressive step toward the making of better butter and improvement in packaging and distributing it was the development of specialized privately owned creameries or butter factories in large cities to which cream might be shipped in cans, even though several days old and sour. The use of some sweet cream, coupled with thorough washing and careful salting, made it possible for such creameries to produce better butter than most of the farm-made butter, which was also made from sour cream.

The next step in butter improvement was the development of local creameries, many of them cooperatively owned by the producers, in country areas in which the dairy farms were located. This made possible the delivery of sweet cream daily and introduced "sweet-cream butter," which, in turn, led to a marked increase in butter consumption. Since butter is a highly concentrated product which, when properly handled, may be kept in good state of preservation for several weeks or even several months, the dairy farm producing cream for buttermaking may be located a long distance from the consumer market and still be under no marketing handicap except the small amount of added freight charge due to the distance the butter must be shipped.

It is now important that the dairy farm selling cream for buttermaking or milk for cheese making be located under conditions favorable to economic production of milk rather than in close proximity to the consumer market.

Areas Favorable to Dairy Farming.—Nearly one-half of all commercial milk produced is consumed as whole milk, sweet

cream, and ice cream. This requires that nearly one-half of all dairy farms be located within a distance up to about 100 miles from a city or town. Since the large cities are the large consuming centers of whole milk, cream, and ice cream, there must be heavy concentrations of dairy farms near them. Since the production and marketing of whole milk offers about the largest opportunity to make a profit from farming of any farm enterprise, dairy cattle often crowd out all other types of farm livestock in areas adjacent to large population centers. This is the explanation of the extensive development of dairy farming in the New England states and in New York. Similar large areas of intensive dairy farming are found in southern California to supply Los Angeles and the many large towns of southern California. Around such population centers as Chicago, Detroit, St. Louis, and the twin cities of Minneapolis and St. Paul, as well as around many other large cities, there are concentrations of dairy farms because of favorable market location. In many of these areas the farm land is not well suited to the production of pasture and feeds for diary cattle. Much of the feed used is shipped in. It is the high price received for the milk that makes possible their profitable operation even under high production costs.

Areas Favorable to Low-cost Production.—A little more than one-half of the total production of milk is consumed as butter, cheese, and the condensed milk products. All of them are highly concentrated and semiperishable. They may all be produced in localities favorable to low-cost production of milk. This has led to concentrations of dairy farming in certain areas especially favorable to it. Since dairy cows utilize grass to good advantage and may utilize a high percentage of roughage in their winter ration, that region of the United States north of the Corn Belt and extending from the Atlantic to the Pacific oceans, omitting the semiarid portion and the mountain ranges, is especially suited to low-cost milk production. This is because of the moderate climate prevailing, the productive soil, the heavy rainfall through the grazing season, and the rolling-to-hilly topography of the land, rendering much of it better suited to grazing than to cultivation.

Dairy farming is also well adapted to almost any Corn Belt farm, especially the smaller farm on which the labor of grow-

ing children can be used to good advantage in tending the dairy herd. On Corn Belt farms dairying is often combined with other livestock enterprises, such as raising hogs, raising sheep, or fattening cattle or lambs. This is done because there is usually a limit to the number of cows that can be milked economically with the labor available. This limit is usually reached before the resources of the farm are fully utilized by the dairy cattle. Some other type of livestock then is used to consume surplus pasture and feeds not required by the milk cows.

Many farms throughout the United States may be developed as successful and profitable dairy farms. The likes of the farmer may sometimes be the most important factor in determining whether a farm should be developed as a dairy farm or whether some other livestock enterprise should be chosen. Extensive concentrations of dairy-cattle production in the future will, however, be likely to continue to center in the regions favorable to dairying from either the market or the low-cost-production viewpoint.

Questions

1. Name the products and by-products of the dairy industry.

2. State the approximate annual per capita consumption of each of the important dairy products.

3. What is the approximate chemical composition of milk?

4. What qualities of milk make it a valuable and healthful food?

5. What are the differences between evaporated, condensed, and dried milk?

6. When and where was the first mechanical cream separator used?

7. What are the principal uses of sweet cream?

8. What are the important ingredients in ice cream?

9. What changes have taken place in buttermaking during the last 50 years?

10. Explain the process of cheese making.

11. What are the principal by-products of milk?

12. What uses are made of each?

13. What proportion of the total beef and veal supply is contributed by dairy cattle?

14. Why are many dairy farms located near large cities?

15. What do you understand to be the difference between the market milk and the local dairy farm?

16. Why are farms selling cream for buttermaking and milk for cheese making located farther from the consumer market than the market milk and local dairy farms?

17. What are the essential requirements for low-cost milk production?

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CHAPTER XV

BREEDING DAIRY CATTLE

Increasing the amount of milk produced per cow per year early in the development of dairying was found to be the most effective means of lowering production costs. Increased milk production per cow is secured in three ways: (1) by improvement through breeding, (2) by improvement in feeding, and (3) by improvement in housing and care. Of these improvements, breeding is recognized as offering the largest opportunity to increase the amount of milk produced per cow. Effort to improve dairy cattle through breeding has had the attention of dairy farmers for many years. It has been found that the percentage of fat in milk is also largely an inherent character and can be influenced permanently only through breeding.

Early Breeding Methods.—In the beginning of specialized dairy farming, efforts to increase milk production through breeding were confined largely to selection based on observation of the form and casual observation of the amount of milk produced at a milking, the amount of cream rising to the top of the milk, and the length of time the cow continued to milk after each freshening. It was noticed that cows of a certain form and of lean or scant muscular development usually produced more milk than cows of different appearance. From this observation there developed the belief that large milk production was closely correlated with the form and appearance of the cow, and on this belief was based the development of the type or standard of excellence in form for the dairy cow. For about 100 years, or from the year 1800 to 1900, efforts to improve dairy cattle through breeding were confined largely to selection toward the prescribed or approved dairy form, the breeder expecting that increased milk production would follow improvement in form. Undoubtedly some increase in milk production per cow was secured by long-continued selection toward the approved form set up for cattle maintained primarily for milk production. There is some corre-

lation between type and production in dairy cattle. Experiences of more recent years, which will be discussed later in this chapter, have, however, demonstrated that the correlation between form and production is not so high as it was thought to be by early breeders.

Formation of the Dairy Breeds.—Before attention was given to the selection of dairy cattle toward a standard type, a number of strains of cattle possessing some characteristics in common and some tendency toward larger milk production had developed in several localities in western Europe and Great Britain. To what extent the tendency toward milk production and the uniform characteristics possessed by these groups were due to environmental conditions and natural selection and to what extent they may have been influenced by earlier selection by man are not known. It is thought that selection practiced by man during the eighteenth century resulted in greater uniformity in such characters as size, color, shape of udder, and degree of fleshiness.

By the early part of the nineteenth century a number of groups had developed sufficient uniformity of characteristics and excellence in milk production to be recognized as strains of cattle that could be depended upon to transmit certain characteristics from generation to generation. It was also observed that when bulls of these strains were mated to cows in other communities milk production in the heifer calves produced exceeded the production of their dams. Just as with beef cattle, a demand for cattle of the improved dairy strains for use as breeding stock developed rapidly. Breeders soon found it to their interest to organize record associations, give their cattle a breed name, and maintain registration. Among the breeds of dairy cattle developed in western Europe and Great Britain during the eighteenth and early nineteenth centuries, from which animals were later imported to the United States to form the foundation for herds in this country, are the Holstein-Friesian, Guernsey, Jersey, Ayrshire, and Brown Swiss breeds. Representative animals of several other breeds have been brought to the United States but have failed to attract interest or attain economic importance.

Following the formation of the pure breeds in western Europe and importation of animals of these breeds to the United States,

improvement of the common mass of dairy cattle has been accomplished entirely by the mating of sires of pure breeding to cows in the common herds. The keeping of records of milk and butterfat production in grade herds has helped to bring about more rigid culling and disposal of low-producing cows, but when a heifer developed larger milk production than her dam because of her inheritance, that inheritance was almost invariably from a purebred sire.

THE BREEDS OF DAIRY CATTLE

The Holstein-Friesian.—This breed of cattle originated in the small lowland country of The Netherlands on the west coast of Europe, just across the English Channel from England. In The Netherlands it is known as the "Friesian breed." In the United States the official name of the breed is Holstein-Friesian. Breeders and others in the United States commonly refer to the breed as "Holstein," dropping the second half of the official breed name. The Holstein is a breed of large cattle, the cows producing the largest amounts of milk of any breed. The milk is low in fat content, testing from 3 to 4 per cent butterfat. The large size, large milk production, and low percentage of fat in the milk are thought to be due partly to the influence of the environment in their native homeland and partly to selection for those characteristics through a period of several centuries. Grass and hay are the principal feeds given to dairy cattle in The Netherlands. A large cow with a large digestive capacity is needed to consume effectively and digest enough grass or hay to produce a large amount of milk. Whether the low fat content of Holstein milk is due to inheritance dating back many centuries or whether it is due to failure on the part of breeders to select for higher fat content through the formative period of the breed is problematical. During recent years some breeders have attempted by selection, and with some success, to increase the percentage of fat in the milk produced by their cows. Establishing the inheritance of fat percentage up to or above 4 per cent in herds in this breed has proved to be a slow process, and few herds have attained the goal of all cows producing milk testing 4 per cent or over.

Distribution in the United States.—The first Holsteins imported by America that were later accepted for registry were brought to

Massachusetts during the decade 1850–1860, the total number being fewer than 10 head. A few were imported during the next two decades. Just as with many other pure breeds of livestock, the decade of extensive importing of Holstein cattle from The Netherlands was the 10-year period 1880–1890. By 1890 the number of purebred Holsteins that had been imported plus their descendants was large enough to satisfy the demand. Further importations were not necessary, and importing was no longer profitable. Very few were imported after 1890.

The steadily increasing demand for cattle of dairy type to supply milk, cream, butter, and cheese to the rapidly growing cities and towns ever since about the year 1880 led to a wide distribution of Holsteins throughout the country. Although Holsteins are found in every state, they met with greatest favor in the Northern half of the country. In the entire area from the Atlantic to the Pacific and north of a line extended east and west from the southern boundary of Iowa, herds of purebred and grade Holsteins predominate among the dairy breeds represented. They also predominate in the intensive dairying area in southern California.

Registry Associations.—During the early history of Holstein-Friesian cattle in the United States two associations were organized. In 1885 the two united to form the present Holstein-Friesian Association of America. This association has since that date registered all purebred Holstein-Friesian cattle in this country. The office of the secretary is at Brattleboro, Vt. A total of about 3,000,000 had been registered by Jan. 1, 1942.

Advanced Registry.—Registry associations for all the well-known breeds of dairy cattle promote the keeping of milk and butterfat production records of one kind or another for the purpose of locating within the breeds and within the individual herds those cows that produce the largest amounts of milk and butterfat and for the purpose of determining the average fat percentage in the milk. Such records are of value to the breeder as an aid in the selection and mating of breeding stock for improvement. The ability of bulls to sire daughters of high milk production or high fat test is determined by comparing records made by daughters of a sire with records made by their dams. Holstein breeders were first among the breeders of the several important breeds of dairy cattle in America to begin

the keeping of production records, and the Holstein Registry Association was one of the first to begin receiving, compiling, and filing such records. In order that production records might be of significance, minimum amounts of butterfat that a cow or heifer should produce during a given period of time have been established by the record associations for each of the breeds. What is called an "advanced registry" is then maintained by

Fig. 29.—The Holstein-Friesian cow, Betsy Roebuck Dixie. Grand Champion Holstein female, National Dairy Show, 1941. (*Photograph by Strohmeyer.*)

the registry association for each breed, and cows that produce the minimum amount of butterfat or more in the specified period of time are entered in the advanced registry. Bulls are listed on the basis of a required number of daughters that have qualified for admission to advanced registry on the basis of their production.

Since production records are now kept for all breeds of dairy cattle and advanced registration is maintained by all registry associations, the requirements for entry to advanced registry for all the breeds will be discussed later in the chapter. The administration of advanced registration for the Holstein breed was for many years directed and the records kept by a staff maintained

especially for that purpose with offices located at Madison, Wis., rather than at the office of the secretary. In 1939 this office and staff were moved to the office of the secretary at Brattleboro, Vt., and are now administered by the secretary of the registry association.

Holstein Type.—The present-day approved Holstein type calls for mature bulls weighing 1,800 to 2,000 lb. and cows weighing 1,200 to 1,400 lb. Large size in this breed is desired, especially if accompanied by deep bodies set on legs of medium length. Top and underline should be straight with the typical wedge-shaped appearance of the approved dairy form pronounced. Holsteins are not faulted if they show moderate thickness of muscling over shoulders, ribs, loin, rump, and thighs, though pronounced thickness of muscle covering giving the appearance of excessive beefiness is objectionable. Udders appear large, teats medium to large, and milk veins prominent. Holsteins are medium in length of neck and medium in length and width of face. The color must be black and white, the two colors preferably distributed about evenly in large patches or spots. Cattle that are solid black except for some white on each leg between the foot and knee or hock and a white tail switch and cattle that are all white except for one or more black spots, even though small, are eligible to registry. Medium-sized horns are present.

The Jersey.—The Jersey is one of the oldest pure breeds of livestock in existence. It was developed on the small Island of Jersey in the English Channel. Besides being one of the earliest of all the groups of cattle to be recognized as of superior merit, since 1789 the purity of breeding has been protected by a law prohibiting the importation of cattle to the Island except for immediate slaughter. The original foundation stock of the breed, no doubt, was taken to the Island from the continent of Europe, though when this occurred is not recorded in history, and no proof can be offered as to when or how cattle first appeared on the Island. It is known that there have been cattle on the Island for 500 years. It is probable that they have been bred without introduction of cattle from outside the Island during this entire period.

Because of the small size of the Island (about 21,000 acres) and the small number of cattle maintained on it (about 10,000)

even uncontrolled breeding would be expected to lead to marked uniformity in type. When efforts to purify strains of livestock and to formulate pure breeds began to be made by selection and controlled mating about the year 1800, the breeders of cattle on the Island of Jersey found they already had a pure breed, in that their cattle possessed many characteristics in common that were uniformly transmitted. Breeding of cattle on the Island during the last 150 years has been directed largely toward improvement of form, since Jersey breeders were strong in the belief that high milk and butterfat production are closely associated with approved dairy form. In its native home, the Jersey, like the Holstein, is maintained the year around largely on grass and hay. The climate of Jersey, however, differs markedly from the climate of The Netherlands in that the winters in Jersey are mild and warm, whereas in The Netherlands they are cold and long. Since the two breeds were developed for many years under similar methods of management and care and received similar feeds, it would be logical to expect that they would be similar in characteristics. They are instead very unlike in characteristics. The Holstein is large in size and produces a large amount of milk with a low fat test of around 3 per cent. The Jersey is small in size, produces a moderate amount of milk, and has the highest fat test of all dairy breeds, varying around 6 per cent. It is hard to believe that the difference in climate alone would account wholly for these differences between the two breeds. The distinctions may be due to differences in the very early foundation stock from which the two breeds were developed, or they may be due to long-continued selection toward different objectives.

Distribution in America.—Just as in the case of Holsteins, the first Jersey cattle of record were imported to the United States during the decade 1850–1860. Importations were light until 1880, when Jersey importations increased along with the heavy importation of animals of many other pure breeds. Differing from some of the other breeds, Jersey importations have continued rather extensively down to the present time. They have received wide distribution in the United States but have met with greatest favor in the Southern half of the country, where they predominate over all dairy breeds. Jerseys are popular in the Eastern states and in eastern Canada, but there they meet competition from the Holstein, Guernsey, and Ayrshire breeds.

Registry Association.—The American Jersey Cattle Club, organized in 1868, has been the only association formed to register purebred Jersey cattle in the United States. The office of the secretary is at 324 West 23d Street, New York City. About 2,000,000 purebred Jerseys have been registered in the United States.

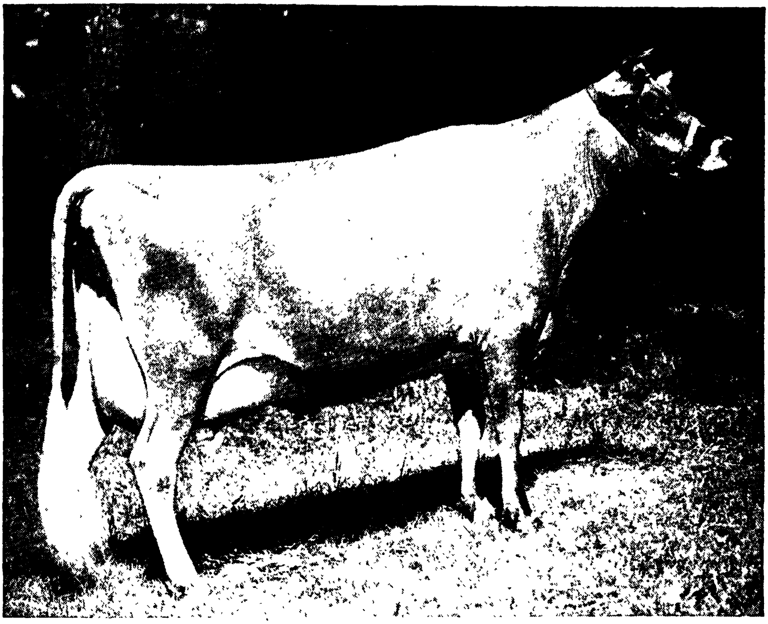

FIG. 30.—The Jersey cow, Cutie of LaVignette. Grand Champion Jersey female, National Dairy Show, 1941. (*Photograph by Strohmeyer.*)

Advanced Registry.—The Jersey Cattle Club maintains the advanced registration of cattle that meet the requirements for entry set up by the association. This work is administered under the direction of the secretary.

Jersey Type.—The desired weight for the mature Jersey bull is 1,500 lb. and for the cow, 1,000 lb. Typical imported animals from the Island of Jersey do not attain these weights. Bulls weighing 1,200 to 1,300 lb. and cows weighing 800 to 900 lb. are more typical Island weights.

Early in the development of the Jersey breed, exportations of Island cattle were made to England. English breeders selected the larger cattle and continued to breed them for larger size in

England. Jerseys imported by America were secured from both English and Island herds. This resulted in bringing to the United States early in the history of the breed in this country many cattle of the larger English type and many of the smaller Island type. Some breeders in America have kept the Island type pure; others have kept the English type pure; and many have interbred the two. This situation has caused considerable confusion among Jersey breeders as to what should be the ideal in size for their cattle. The controversy can hardly be considered settled as yet. It can be said that, generally speaking, American breeders prefer cattle of somewhat larger size than that possessed by cattle of the pure Island type. By selection and interbreeding of the English and Island Jerseys, a type adhering as closely as possible to the Island cattle in form but possessing larger size has been developed. Cattle of this type are commonly referred to as "American" type Jerseys. Whether large or small, all Jersey cattle should show the same proportionate body form: a straight top and underline, a deep body, with good body width and well-sprung ribs, pronounced wedge shape, short legs, neck medium to short, and face short, broad, and dished. This breed is noted for well-formed udders, teats of medium size, and prominent milk veins. Jersey cattle are generally fine in bone, thin in skin, and extreme in leanness or absence of excessive muscle development. The typical color is a mouse color or light fawn, though a wide variation in color is found and permitted within the breed. The color may vary from almost a solid black through varying degrees of white patching or spotting to the more popular solid mouse or fawn color. Medium-sized horns are present.

The Guernsey.—Originating on the Island of Guernsey, another small island, 16,000 acres in size, located in the English Channel, a short distance from Jersey, the Guernsey breed of cattle has many points in common with or similar to the Jersey. It is thought to be descended from the same foundation stock but is not thought to have been so free from the influence of outside blood as the Jersey. Cattle similar to the Guernsey were developed in Alderney, another small island in the Channel. Cattle from several small islands near Guernsey are now registered in the Guernsey herdbook. In its native islands the Guernsey has been selected for somewhat larger size, but as a breed it is

not so uniformly true to the ideal in dairy form as the Jersey. It also has a different color pattern, the typical color being a spotting of reddish fawn and white which may vary to either a high percentage of fawn or a high percentage of white. Guernsey cows vary from Jerseys, also, in producing slightly larger amounts of milk of higher color and from 0.5 to 1 per cent less fat, the typical fat content of Guernsey milk being 5 to 5.5 per cent.

Distribution in America.—The first Guernseys that were later accepted for registry in the United States were imported to Massachusetts and Pennsylvania during the period 1830–1850. Extensive importations were not made until the decade 1880–1890. Importations of Guernseys have continued to the present time, with a particularly large number arriving during the period 1910–1930. It was not until about the year 1910 that Guernseys began to receive enthusiastic approval in this country. They then began to receive wide distribution throughout the country but are still found in largest numbers in the Eastern and Northern states.

Registry Association.—There has been only one association organized for the registry of Guernsey cattle during the history of the breed in the United States. It is the American Guernsey Cattle Club, organized in 1877. The office of the secretary is at Peterborough, N.H. Nearly 1,000,000 purebred Guernseys have been registered.

Advanced Registry.—An advanced registry of cattle meeting the requirements set up by the association is maintained as a part of the work of the secretary of the registry association.

Guernsey Type.—Mature Guernsey bulls should weigh 1,600 to 1,800 lb. and cows, 1,000 to 1,200. The breed runs fairly uniform for size and does not present the puzzling problem of variation in size encountered in the Jersey breed. Conformance to ideal dairy form is desired but has not yet been attained to so marked a degree as in the Holstein and Jersey breeds. To accomplish this end, special emphasis needs to be placed on straightness of lines, spring of ribs, width and depth of chest, levelness of rump, width of rump, and straightness of rear legs. Attention must also be given to selection for udders showing levelness, balance, and better attachment at both front and rear of udder. The neck should be of medium length, the head

medium to short, the face medium to wide, and the face dished. The typical Guernsey color is a deep reddish fawn, with considerable white showing on legs, belly, and in spots over the body. The switch of the tail should be white.

A characteristic of the Guernsey not evidenced in its body form, yet responsible in large measure for the recent rise to popular favor of the breed, is the rich yellow color and large size of the fat globules that give the "cream line" of Guernsey

FIG. 31.—The Guernsey cow, Smuggler Farm Rewards Lass. Grand Champion Guernsey female, National Dairy Show, 1940. (*Courtesy American Guernsey Cattle Club.*)

milk a pronounced appearance easily detected in bottled milk. This is of greatest value in the production of market milk or milk to be sold for use as fluid milk. It is thought by many breeders that a strong yellowish color of the skin and of the secretion on the inside of the ears is an indication that cows possessing it will produce milk of high color.

The Ayrshire.—Taking its name from its native home, the county of Ayr in southwest Scotland, the Ayrshire is a breed that has met with more favor in its homeland than in other countries. Climatic conditions and feed supply in Ayrshire are somewhat similar to those of the New England states,

Pennsylvania, and eastern Canada. Because of its hardiness and adaptability to dairying in this area, the breed has been introduced and is well established throughout the area. It is thought that the foundation stock of the Ayrshire breed included a mixture of cattle from The Netherlands, from Jersey and Guernsey, and of Shorthorns from the Tees Valley in England. It was not until about the year 1800 that the cattle of Ayrshire began to show sufficient uniformity and excellence to attract attention and gain recognition as a breed.

Distribution in America.—Although it is one of the youngest of the pure breeds of dairy cattle, the Ayrshire was also one of the earliest to be represented by importations to America. After getting a good start from importations made between the years 1830 and 1860, the breed later had to give way to competition from the Holstein, Jersey, and Guernsey breeds. Always noted for its hardiness, attractiveness in appearance, its well-balanced and strongly attached udder, during the early history of the breed in the United States and Canada, it failed to meet the requirements of a popular dairy breed because of the small-sized teats of the cows, making hand milking difficult, and because the milk and butterfat production of many of the cows was not large. Improvement in size of teats and amount of milk produced through careful attention to selection in the better purebred herds during the last fifty years has accomplished much toward correcting both faults.

Registry Association.—The American Ayrshire Breeders Association, organized in 1875, has been the only association registering Ayrshire cattle in the United States. The office of the secretary is in Brandon, Vt. About 300,000 cattle have been registered.

Advanced Registry.—Advanced registration of Ayrshire cattle is maintained and administered by the secretary of the registry association.

Ayrshire Type.—Ayrshire bulls should weigh around 1,800 lb. and cows around 1,200 lb. In form the Ayrshire diverges from the ideal dairy type only in that cows and bulls both show thicker muscling throughout than is found in the Holstein, Jersey, and Guernsey. This gives animals of this breed a full-made, symmetrical appearance, which, with their straightness of lines, deep bodies, short legs, and well-carried udders, gives them an

attractiveness or "style" unequaled by any other breed of dairy cattle. Possessing naturally long horns, breeders have capitalized on this characteristic by developing methods of training the horns to grow in an upward, gracefully curving position, which adds further to the style or flashiness of appearance. In color, Ayrshires are red and white, the red generally predominating on the body, but the color may be a definite spotting in small or large spots of red and white. The white color may predominate on the body, with only a small amount of red about

FIG. 32.—The Ayrshire cow, Annandale Buntie. Grand Champion Ayrshire female, National Dairy Show, 1941. (*Photograph by Strohmeyer.*)

the head and neck. The red ranges from a very dark, almost black in some bulls to a pale, about yellow in some cows. A well-balanced udder carried close to the body, with teats of sufficient size to facilitate ease of milking, is considered characteristic of the breed.

The Brown Swiss.—Originating in the small, mountainous country of Switzerland, one of the oldest of the pure breeds of livestock, the Brown Swiss, is the youngest among the dairy breeds to attain prominence and economic importance in the United States. In their native home, cattle of the Brown

Swiss breed are still used for draft purposes as well as to supply both beef and milk. This triple-purpose requirement brought about the production of a breed of cattle of large size and dual-purpose form.

Distribution in America.—The first importation of Brown Swiss cattle to America consisted of a few head brought to Massachusetts in 1869. They met with no great amount of popular favor, and as a result later importations were scattered and small in numbers. Descendants of the few that have been imported in time began to mount in numbers, and as they did, they attracted attention and greater favor with many dairy farmers. Their large size, easy keeping qualities, and ruggedness appeal to many dairymen. Although the breed is classed and bred as of purely dairy type, the large size and thickness of flesh covering give them a beef value superior to that of any other dairy breed. Likewise, the large size and meatiness of the calves give them a rating as ideal for veal calves. Selection for improvement in dairy form and increased milk production by American breeders during the last twenty-five years has shown marked results, and the breed has gained greatly in popular favor during that period. Herds of Brown Swiss are now found in nearly every state, with some concentration in the Corn Belt area.

Registry Association.—Brown Swiss cattle are registered by the Brown Swiss Breeders Association, organized in 1880. The office of the secretary is at Beloit, Wis. About 125,000 cattle have been registered.

Advanced Registry.—The advanced registry for Brown Swiss cattle is maintained by the secretary of the registry association.

Brown Swiss Type.—Brown Swiss breeders take pride in the fact that they have the largest cattle of all dairy breeds. Bulls should weigh around 2,000 lb. and cows 1,400. Many animals of both sexes attain greater weights, but weights above those given are not considered desirable. Although Brown Swiss breeders value the tendency toward thick muscling in their cattle, they accept the ideal dairy form as the type to be desired and continually select toward it in their attempts to improve their breed. It is their aim to produce cattle with straight lines, the typical dairy wedge form, deep bodies, short legs, long, level rumps, straight rear legs, well-balanced and well-carried

udders, fine quality of bone, and thin skins. At the same time they hope to retain a little more muscle covering than is found in the Holstein, Jersey, and Guernsey breeds and to maintain the advantage in size they now have. Brown Swiss cattle vary from a light gray or mouse color to almost black. No white is permitted except on the udder. This may extend forward to the navel. Whether the general body color is light or dark, there is always a streak of color down the center of the back lighter than the body color. Short, thick horns are present.

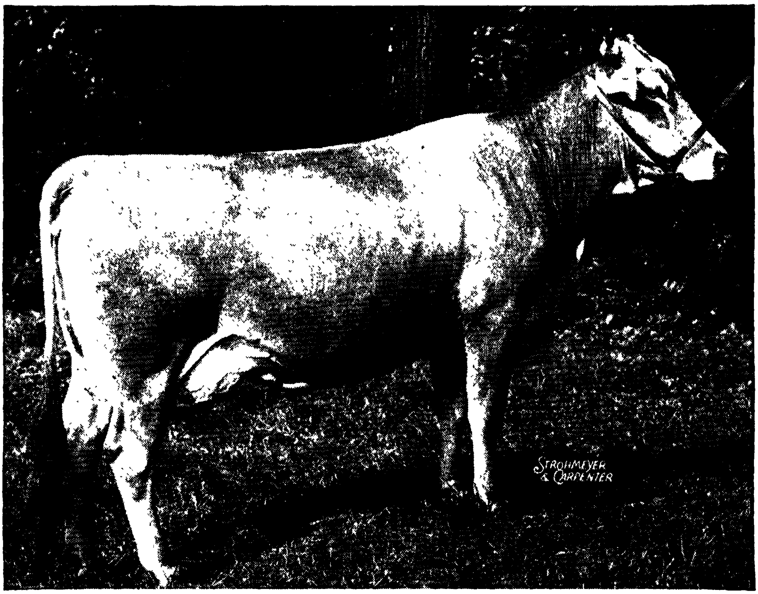

FIG. 33.—The Brown Swiss cow, Jane of Vernon V, Grand Champion Brown Swiss female, National Dairy Show, 1941. (*Photograph by Strohmeyer.*)

METHODS OF BREEDING DAIRY CATTLE

Breeding Purebreds.—Just as with beef cattle, the improvement of the great mass of dairy cattle of the world during the past 150 years has been accomplished by first developing the pure breeds, then fixing within them the ability of sires to transmit increased milk production, and, finally, by mating the improved purebred sires to cows in common herds. After the beginning of registration, thus closing the pure breeds to any influence from outside blood, improvement within them has

been made by the setting up of ideal standards in size, form, quality, udder conformation, and other characteristics, then selecting as rigidly as possible toward those characteristics by observation. By this method of selection milk production has increased only insofar as it is influenced by form. Milk production is probably influenced by form only insofar as improvement in form affects ability of the cow to eat more feed, though selection for leanness of form and indications of a highly developed nervous system, larger udder capacity, and well-developed milk veins may have stimulated more active functioning and larger capacity of the mammary system, thus making possible the conversion of more feed into milk. It is probable that even before the keeping of any form of written milk records was begun, some attention was paid to such factors as the amount of milk given at a milking and the length of lactation period, and these factors probably influenced selection to some extent, so that selection was being based partly on production even before production records were kept.

Inbreeding.—There has been some inbreeding within the breeds of dairy cattle. Inbreeding probably was practiced to a considerable extent before registration and the issuing of pedigrees was begun. In recent years it has been resorted to in the hope that it would ensure inheritance of large milk production or high fat percentage with greater certainty than would be expected from the mating of unrelated animals, even though both sire and dam had high production records. Many outstanding families are recognized in each of the breeds of dairy cattle. Such families usually were founded by one outstanding cow, her descendants including all cattle that trace to her, comprising the family. Considerable inbreeding within such families has been practiced in all the breeds. Of how much value such inbreeding has been it is difficult to estimate. It can be said that in many cases it has not proved injurious. More knowledge of the mechanism of inheritance now being gained from experimental studies of inheritance through the genetic approach may in future years result in greater and more progressive use of inbreeding for increased milk production or higher fat content.

Show-ring Winnings.—Many matings of dairy cattle have been based on show-ring winnings. Using the show ring as a

guide in selecting breeding stock has been of value to many breeders in improving form or type in their cattle. How much has been gained in increased milk production through the use of show-ring winners as breeding stock is more difficult to determine. Many breeders of today place less confidence in the show ring as a guide to probable milk production than was the custom twenty-five to fifty years ago.

Crossbreeding.—Crossbreeding has been used less in dairy cattle production than with most other kinds of farm animals. In practice, crossing of the dairy breeds seems to produce more undesirable than desirable results, and dairymen have not taken kindly to it. In recent years there has been some crossing of dairy cows with beef bulls to produce calves that can be grown to market weights for the beef market, but there is no place in a breeding herd for such females unless the farmer wishes to continue with beef sires and change his herd from a dairy to a beef herd.

Grading Up.—This is the term applied to the breeding plan when a purebred bull is mated to cows of common or unknown ancestry and the first purebred sire is followed with others of the same breed. By this grading-up plan the herd, after several purebred bulls have been used, begins to show nearly all the characteristics of the breed from which the sires were selected and to compare favorably with purebred herds in the amount of milk and butterfat produced.

Production Records.—The keeping of an accurate record of the amount of milk produced by a cow during a lactation period and determining the fat content by testing a sample of the milk at intervals are two of the most progressive developments in the dairy industry during the last fifty years. The purpose of keeping milk records is to locate those cows in a herd that produce the largest amounts of milk and butterfat so that they may be retained as breeding stock and to locate the low producers so they may be culled out. The production records of his daughters, compared with the production records of their mothers, are the most reliable guide in determining the ability of a bull to transmit high production to his offspring. Accurate milk and butterfat records have been found to be the most reliable of all guides in selecting breeding stock for increased milk and butterfat production.

The keeping of milk records was begun by some breeders and encouraged by some registry associations even before the invention of the Babcock test made possible the accurate determination of the butterfat content of milk. The keeping of butterfat records, however, began with the introduction of the Babcock milk tester in 1894. This simple machine made possible the quick, easy, and inexpensive determination of the fat percentage in a sample of milk.

Since the milk of a cow does not fluctuate widely in fat content from day to day or even from month to month, it was soon found that if the weight of the milk produced was accurately kept and a sample of both morning and evening milk taken and tested once or twice each month, only a little simple arithmetic was required to determine quite accurately the amount of fat produced by a cow in a month or during a complete lactation period. From that time on, keeping milk records and determining the fat content have been encouraged for use as the basis for selecting dairy cattle for increased production by every agency interested in the dairy industry. The purebred registry associations, cooperating with state agricultural colleges, have been the two most active agencies in promoting and supervising record keeping to ensure a high degree of accuracy of the records. Breeders themselves have been most active in publishing records made by their cattle, because production records have been their most effective advertising material.

Advanced Registry.—Early in the history of the keeping of production records the purebred-registry associations developed the plan of setting up minimum requirements of production on which animals would be admitted to an advanced registry list. A certificate of advanced registration was then issued to the owner of each animal when it met the requirements of milk and butterfat production. At first short-time records of 7, 30, or 90 days were used as the basis for admission to advanced registration. At present the most popular of all production records and the record considered the most reliable for predicting the transmission of high production is the 365-day record. Second is the 305-day record, requiring that the cow produce another calf (in most breeds) not later than 14 months after the date of the previous freshening. The requirement for admission to advanced registry on the basis of the 365- and 305-day records of

mature cows by the several registry associations are given in Table X.

Bulls are admitted to advanced registry by all record associations when they have sired three or, in some breeds, four daughters that have qualified and that are out of different dams.

Many different sorts of records are recognized by the several registry associations as having various degrees of significance. Rules and requirements have been changed frequently. The reader interested in the details of official testing is, therefore,

TABLE X.—REQUIREMENTS FOR ADMISSION TO ADVANCED REGISTRY OF MATURE COWS

Breed	305-day record, pounds butterfat	365-day record, pounds butterfat
Holstein	415	480
Jersey	360	400
Guernsey	360	400
Ayrshire	400	480
Brown Swiss	330	360
Milking Shorthorn	270	300
Red Polled	300	300

advised to secure pamphlets giving the method of procedure, requirements, rules, and regulations from the secretaries of the respective registry associations.

Herd Tests.—A comparatively new kind of production record now maintained by most of the dairy registry associations is called the "herd test." It requires that a record be kept of the amount of milk and butterfat produced by every purebred cow in the herd. A high herd average is then considered to be an indication of uniform excellence in production of all the cows in the herd and is, no doubt, a better criterion of progress being made by a breeder than a few records from a few selected cows.

Herd Classification.—To go along with the herd production test, several of the associations have inaugurated a herd-classification plan by which an expert, approved judge is called in to score each animal in the herd on the basis of its conformance to breed type and such desirable characters as size, form, and quality. The classification or scoring by an expert judge indicates to the

breeder which of his animals most closely approach and which diverge furthest from correct type and body form. By culling those animals that have low production records and those that are given a low rating by the classification judge, it is expected that a herd combining high production with correct type and form will result, and that is the goal of every dairy-cattle breeder.

Questions

1. How may increased milk production be secured?

2. What is meant by the correlation between form and milk production in dairy cows?

3. How did the pure breeds of dairy cattle originate?

4. Name the leading breeds of dairy cattle in the United States.

5. Where did each of the five leading breeds of dairy cattle originate?

6. In what parts of the United States is each of these leading breeds now found in largest numbers?

7. About how many cattle of each dairy breed have been registered in American registry associations?

8. Give the address of the secretary of the registry association for each breed.

9. Give the distinguishing present-day characteristics of each breed.

10. To what extent has each of the following practices been used in breeding dairy cattle for improvment: selection by observation; inbreeding; crossbreeding; grading up; keeping production records?

11. What are the requirements for entrance to advanced registry on the basis of 305- and 365-day butterfat records for cows of each of the breeds that maintain advanced registration?

12. What is meant by the herd test for dairy cattle? By herd classification?

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CHAPTER XVI

FEEDING DAIRY CATTLE

The feeding plan followed and the feeds given comprise the second important factor determining the amount of milk produced per cow and the cost of production. In practice, good breeding and good feeding must go together. Any advantage gained from good breeding will be lost if the cow is not fed enough of the right kinds of feed to meet the needs of her maximum producing ability. Likewise, it is impossible to get high production from a poorly bred cow, no matter how well she may be fed.

Importance of Grass.—Although grass does not occupy so important a place in dairy-cattle feeding as it does in beef-cattle and sheep feeding, it can and does form the basic feed for most dairy cattle through the grazing season. Many herds of milk cows are maintained on grass as their only feed throughout the grazing season. This can be done successfully and profitably only when rich, abundant grass growth is available. A dairy cow bred for the production of a large amount of milk and butterfat does not have capacity to eat and digest enough grass to provide the amount of nutrients necessary to produce the amount of milk she could produce. Although the dry-matter content of grass is well balanced and its nutrient compounds are easily digested, its high water content (80 to 90 per cent) makes it so bulky that the digestive system of the cow becomes filled before she has consumed enough nutrients to supply her needs. If forced to subsist on grass alone, many cows bred for high production will draw on their own body tissues in keeping up their milk production for a time and then decline in production.

Supplementing Pastures.—Good dairy feeding through the grazing season requires that good pastures be available continuously for moderate-producing cows and that high-producing cows be fed concentrate feeds in addition to the grass. Since permanent pastures invariably pass through a period of slow

growth through the hot, dry summer weeks, it is essential that they be supplemented by providing a summer supplemental pasture, such as sweet clover or Sudan grass, or that they be supplemented by feeding silage or hay. If silage or hay is used to supplement pasture for the moderate-producing herd, either one may as well be fed in bunks or racks outdoors, allowing all cows in the herd to eat what they will of these feeds, in addition to the grazing they may do.

Supplementing Grass for High-producing Cows.—Cows that have been bred to the lean dairy type and have highly developed mammary systems capable of producing large amounts of milk, even though they may be deep bodied and possess large digestive capacities, cannot eat and digest enough grass to supply their needs. It is good economy to feed such cows a concentrate ration throughout the grazing season. Since the dry-matter content of pasture grass is about properly balanced in the proportion of digestible protein to other nutritive compounds, it is not essential that a concentrate mixture for supplementing grass pasture be especially high in protein content. A mixture of farm grains such as corn, barley, and oats, fed in the needed amounts, will be satisfactory except for cows producing more than 50 lb. of milk or 2 lb. of butterfat per day. For such cows it is necessary to add to the grain mixture to bring the protein content up to an adequate amount, about 10 per cent, of a protein supplemental feed running around 40 per cent of protein.

How much grain should be fed to the high-producing dairy cow while on pasture is determined by the kind and abundance of pasture growth and by the amount of milk the cow is producing or will produce when grain is added to the grass ration. A pasture of mixed grasses and legumes will require slightly less supplementing than a straight grass pasture. The grass ration for cows producing 3 per cent fat-content milk will require less supplementing per pound of milk produced than for cows producing 5 per cent fat-content milk. Because it is impossible to determine just how much of her needed supply of nutrients a cow is getting from grass, it is good feeding practice to be liberal in supplying the grain supplement. It is found in practice that grain feeding can generally be carried on with profit whenever a cow is producing more than 20 lb. per day of milk containing 5 per cent fat, 25 lb. containing 4 per cent fat, or 30 lb. containing

3 per cent fat. A simple grain mixture without a protein supplement should then be fed at the rate of 1 lb. of grain per day for each 3 lb. of 5 per cent milk, 4 lb. of 4 per cent milk, or 5 lb. of 3 per cent milk produced. The simple grain mixture will suffice until cows producing about double the preceding amounts of milk are to be fed. The grain ration should then have added to it at least 10 per cent of a high protein content supplemental feed. Thus a cow on pasture producing 40 lb. of milk testing 4 per cent fat should receive 10 lb. per day of a simple grain mixture, whereas a cow producing 80 lb. of milk testing 3 per cent fat should receive 16 lb. per day of a grain mixture to which has been added 10 per cent of protein supplement. It is readily seen from the foregoing that cows receiving grain on pasture must be fed their grain individually if they are to be fed economically.

Winter Feeding Cows in Milk.—It is the practice on many dairy farms to have as many of the cows in the herd as possible freshen during the fall months. The period of heaviest milk production on those farms is during the winter months. Liberal feeding of a properly balanced ration is then essential to high production, to low-cost production, and to the maintenance of health of the cows. During the past fifty years many experiments to study the feed requirements and methods of feeding dairy cows for most profitable production have been made at many experiment stations. A vast fund of knowledge concerning the problems involved is now available.

Factors Affecting Winter-feed Requirement.—Proper feeding of milk cows must be based on many factors that influence the amount of milk the cow will produce. First of these is the breeding or inherited ability of the cow to produce milk. Many low-producing cows possess so little ability to produce milk that only a modest amount of feed is required. To feed them more would be a waste of feed, because the cow could not utilize it in milk production. Other cows have the inherited ability to produce so much milk that their need for feed must be carefully and scientifically determined, and even then it is difficult to formulate rations that will enable them to reach their maximum ability to produce.

Young heifers do not reach their maximum growth or functioning of the mammary system until they are about five years

old. They are, however, mated to freshen at twenty-four to thirty months for the first lactation period and pass through two or three lactation periods before reaching full maturity and maximum production. Age of the cow is, therefore, the second factor in determining feed needs.

The kinds of feeds available and their comparative costs constitute the third important factor in selecting the feeds for a dairy ration. Many feeds are interchangeable without lowering the efficiency of the ration appreciably, and often some slightly less desirable feeds may be used to lower the cost of producing a pound of butterfat, even though the amount of butterfat is also lowered a trifle.

Composition and Digestibility of Feeds.—If the preceding factors are kept in mind, it is seen also that intelligent feeding of the cow requires a knowledge of the digestibility of different feeds. A farmer cannot expect to have samples of the feeds he is using analyzed or their digestibility determined. Hundreds of samples of feeds of various kinds have been analyzed, and many digestibility determinations have been made. It is, therefore, possible to find among the results of such analyses and digestion determinations average figures for the kind of feed in question, and they may be used as a fairly satisfactory indication of the chemical composition and digestibility of the supply of feed at hand.

Nutrients Required for Maintenance and Production.—Knowledge of the requirement of digestible nutrients for maintenance of the cow and for milk production is necessary in compounding rations. Many experiments have been made in efforts to develop methods or standards from which to calculate the amounts of the several digestible nutrient compounds needed by cows producing varying amounts of milk and butterfat. Most such standards are complex and not suited to direct application by practical feeders. It is from them, however, that simpler methods of determining the kinds and amounts of feeds to use in terms of kind of feed and number of pounds required are formulated.

Supplying Minerals and Vitamins.—For many years it was thought that the amount of digestible protein, carbohydrates, and fat was the only important problem involved in proper feeding of milk cows or any other type of animal. It is now known that the supply of mineral compounds and vitamins in the feed

is of major importance in the feeding of several kinds of animals, among which the dairy cow in milk is an outstanding example. Besides containing protein, carbohydrates, and fat, milk contains some mineral matter and some vitamins. To produce normal milk, therefore, the feed supply of the cow must contain the necessary minerals and vitamins to provide the need of these compounds for her own maintenance and enough more to supply those needed in the production of milk. Three mineral elements particularly are needed in proper amounts. They are calcium, phosphorus, and iodine. In a few areas, it has been found that there may be a deficiency of iron, copper, or cobalt in feeds commonly supplied.

Of the six generally recognized vitamins or vitamin groups, all are probably needed by the dairy cow. Two have been found to be deficient in many dairy rations. They are vitamins A and D. Vitamin A is needed for growth in the young dairy animal, later for reproduction and milk production. Vitamin D is needed in the normal functioning of body activities of the cow and is contained in milk. Vitamin A is found in green grass, silage, and in legume hays. Vitamin D is manufactured directly in the body of the animal when exposed to the direct rays of the sun. It is also present in hay cured in the sunlight.[1]

Although attention must be given to the mineral and vitamin content of the ration in feeding dairy cows in winter, the problem of supplying these compounds is simplified by the fact that most dairy rations that fulfill the need of the cow for protein, carbohydrates, and fat will also contain the necessary minerals and vitamins. There are exceptions to this general rule, and an otherwise satisfactory ration may be deficient in either minerals or vitamins or both. When a possible mineral deficiency of calcium or phosphorus is suspected or known to exist, it may be cheaply and easily supplied by adding 1 lb. of animal-feed bone meal to each 100 lb. of grain ration fed. When a deficiency of iodine is suspected it is most cheaply and satisfactorily supplied by feeding "iodized salt" in place of clear salt. Iodized salt is simply common salt to which a small amount of potassium iodide has been added. It is considered good feeding practice to feed iodized salt to all livestock, especially in those areas known to

[1] Petersen, W. E., "Dairy Science," pp. 328–332, J. B. Lippincott Company, Philadelphia, 1939.

be iodine-deficient, such as the North Central or Great Lakes area of the United States. In case of a suspected or known deficiency of vitamin A, this may be supplied best by providing a legume hay or silage or preferably both in the ration. It seems that any sun-dried hay or exposure of the animal to the sunlight takes care of the vitamin D needs. About the only time cows are likely to experience a need for a vitamin D supplement is during the winter months when there is little sunshine and if low-grade, poorly cured hay is fed. Cod-liver oil is a good source of both vitamins A and D. In case of a suspected deficiency of either, it is recommended that cod-liver oil be fed in small amounts to make up the deficiency.

Most Suitable Roughage.—Experiments at experiment stations and experience in feeding dairy cows on farms have demonstrated that two groups of roughages, legume hays and silages, head the list of all forms of roughage in value and suitability for feeding dairy cows. Legume hays are suitable because usually they are high-yielding and consequently low-cost roughages from the production standpoint. They are, generally speaking, highly palatable. Their greatest value is found in their high content of digestible protein. Add to this their high mineral content and the fact that they usually carry an appreciable amount of both vitamins A and D, and we have reason enough why the legume hay crops should form the basis for the roughage part of all dairy rations. Cows are usually allowed to eat as much legume hay as they will.

Silage made by cutting green corn, green sorghum, or other green material into small particles and storing it in an airtight silo or storage space is valued as a cow feed because it is also a high-yielding, low-cost form of roughage. Silage is generally highly palatable, and it is thought that its high water content or succulence also contributes to its desirability, though the importance of this characteristic is beginning to be questioned by students of nutrition. Silage has a slightly laxative or conditioning effect on the digestive system, and this characteristic does have value. Although not so high in protein content as the legume hays, the dry matter of silage is higher in protein content and in total digestible nutrients than the dry matter of nonlegume dry roughages. Silage is generally fed ad libitum, and the cow is allowed to eat all she cares to of it.

Most dairymen prefer to feed both legume hay and silage. Some are satisfied with legume hay as the only roughage; others prefer to feed silage and a nonlegume hay rather than to get along with legume hay only.

Feeding Value of Legume or Grass Silage.—For many years silage was made only from corn or sorghum. Recently the practice of making silage from the legume crops and grasses has come into use as a means of saving such crops when rainy weather makes it impossible to make good hay from them. Such crops will keep reasonably well if put into a silo without treatment, but it is considered profitable either to add 5 to 8 gal. of molasses per ton of green material in order to ensure sufficient fermentation to preserve the silage or else to add an acid preservative to prevent fermentation and putrefaction and thus ensure preservation by preventing the progress of chemical or bacterial action. Silage from legumes and grasses is especially valued as a rich source of vitamin A or carotene, from which vitamin A is made. It is, on the other hand, a very poor source of vitamin D. The economy of making grass silage for any other reason than the saving of a crop of hay that otherwise would spoil because of a rainy harvest season is doubtful.

Most Suitable Concentrates.—Only cows producing a very moderate amount of milk per day (10 to 20 lb.) can be carried on dry roughage and silage. Higher producing cows must receive a "concentrate" ration in addition to the roughage. Three groups of concentrate feeds, (1) the farm grains, (2) the mill by-product feeds, and (3) the high-protein-content supplemental feeds are drawn upon in formulating the concentrate part of the ration. The concentrate feeds are needed because the cow is confronted with the same problem in attempting to secure enough nutrients from hay and silage in winter as she is in attempting to secure enough nutrients from grass in summer. Hay and silage are like grass in that they are very bulky; the digestive system of the cow becomes filled before she has taken in the necessary amount of digestible nutrients. The concentrate feeds overcome this handicap, because they are high in digestible nutrients, low in fiber and water content, and require less space in the digestive system in proportion to their nutritive value. As much roughage as is commensurate with maximum production is always fed, because the roughage is the cheaper part of the ration, and some roughage

is necessary for the proper functioning of the digestive system of the cow. A mixture of farm-grown grains plus the needed amount of purchased protein supplement should comprise the concentrate part of the ration on farms on which home-grown grains are available. When additional concentrate must be purchased, often the mill by-products such as wheat bran and middlings may be secured at lower cost than farm grains. Sometimes such feeds as cane or beet molasses and beet pulp offer an opportunity to lower the cost of the ration. Following are examples of several commonly used concentrate rations:

	Per Cent		Per Cent
Ground shelled corn	60	Ground barley	50
Ground oats	30	Ground oats	40
Protein supplement	10	Protein supplement	10
Ground shelled corn	30	Ground corn	30
Ground barley	30	Ground oats	30
Ground oats	30	Wheat bran	30
Protein supplement	10	Protein supplement	10

Ground sorghum seed may be substituted for corn or barley in any of the rations.

The protein supplement may be selected from a list including linseed meal, cottonseed meal, soybean-oil meal, and corn-gluten meal. All these supplements contain around 40 per cent protein. They may be readily interchanged for one another in the dairy ration according as the cost per pound of digestible protein they contain would dictate in buying the low-cost feed. Many dairymen like to use a mixture of two or more of the protein supplement feeds rather than any one alone. Experimental results show that there is some little advantage in doing this with other types of animals.

Once the concentrate mixture has been prepared, the next step is to determine the amount to be given. This can be done on the same basis as recommended for determining the amount of grain to feed heavy-producing cows on pasture, except that the feeding of concentrate in winter must begin at a lower production point than is necessary on pasture. In winter feeding the cow producing more than 10 lb. of milk per day, testing 5 per cent fat, should receive 1 lb. of concentrate for each 3 lb. of milk produced; the

cow producing more than 15 lb. of milk, testing 4 per cent fat, should receive 1 lb. of concentrate for each 4 lb. of milk produced; and the cow producing more than 20 lb. of milk, testing 3 per cent fat, should receive 1 lb. of concentrate for each 5 lb. of milk produced.

Feeding the Dairy Bull.—The dairy bull is generally maintained under confinement throughout the year. This is partly because hand mating of the cows to control the desired freshening date and the age of mating heifers is essential to good dairy practice. Another reason is that many dairy bulls develop vicious dispositions, and it is dangerous to allow them to run loose. This requires individual feeding and care of the bull. The starting point in this feeding should be the provision of a well-fenced pasture lot near the farm, large enough to provide grazing throughout the grazing season. A well-built shelter in the lot will convert it into a suitable winter quarters for the bull. If his care can be provided for in this way, the feeding will be greatly simplified, since it will require only the giving of the amounts of the same feeds used for the cow herd that prove necessary to maintain him in healthy, thrifty condition. This will be about the same amount of feed required by one good cow.

Feeding Yearling Heifers and Bulls.—The feeding of growing heifers and the developing of young bulls that have passed the milk feeding period require no special effort. They are usually fed the same feeds being given the cow herd, and these feeds, if properly selected for the cow herd, are also suited to the growing yearlings. It is doubtful if it pays to turn young heifers or bulls to pasture until they have reached the age of about twelve months. From this age on, dairy heifers will get along well on pasture alone in summer but should have their legume hay and silage ration supplemented with 3 to 6 lb. of grain per head per day in winter. If pastured at all, yearling bulls must be pastured in a group separate from the heifers. It is advisable to have a good-quality dry roughage before the bulls along with the pasture and to feed them a liberal allowance of grain in order that they may develop normally and show to best possible advantage to prospective purchasers. At no point will liberal feeding of dairy cattle pay a larger return than in the feeding of young bulls from the age of eight months until they are sold, provided they are to be sold as prospective herd bulls. In

winter a legume hay may be fed to yearling heifers and bulls, and they may be allowed to eat all they will of it. It is desirable to feed a moderate amount of silage or nonlegume dry roughage, also. If silage is fed, it is advisable to hold back on it a little and not to try to make it a major part of the ration. Best results will be obtained if medium-sized yearling heifers or bulls are limited to 10 to 15 lb. of silage per head per day and large yearlings are limited to 15 to 20 lb.

Feeding the Dairy Calf.—The raising or feeding of the beef calf during the milk stage is simplified by allowing him to nurse his mother. This is nature's way of feeding young animals. Profitable dairying requires that the calf be denied the privilege of nursing his mother and that he also be deprived of the butterfat in the milk. This introduces a problem and a responsibility in the care and feeding of young dairy calves that must be given intelligent and faithful attention if success is to be had.

The Milk Requirement.—Dairy calves are allowed to remain with and nurse their mothers for 3 to 5 days in order that they may benefit from the colostrum milk. It has been found that if the digestive system of the calf is to get a good start in normal functioning, it is necessary that its first feed be the colostrum milk from its mother. The surest and easiest way to accomplish this is to allow the calf to nurse during the first few days. It is then desirable to remove the calf from the stall of the mother and begin to feed it on whole milk, preferably that drawn from its mother. Getting the calf started in drinking milk from a pail requires placing two fingers in its mouth, then coaxing and patiently forcing its nose into the milk in a pail so that its sucking of the fingers will draw milk into the mouth. Careful and patient repetition of this plan of feeding will in several days be rewarded by the calf's learning to drink without the fingers, after which giving the milk is simple. Young calves fed in this way must be confined individually for about an hour after the milk is given to prevent them from forming the habit of sucking the ears, flanks, or purses of one another.

It is recommended that calves be fed whole milk until they are two to three weeks old, when skim milk may be gradually substituted for the whole milk by replacing 1 lb. of whole milk with 1 lb. of skim milk each day until the change is completed. Calves must be fed milk according to their size. A safe rule to

follow, suggested by Petersen,[1] is to feed an amount of milk per day equal to 8 per cent of the weight of the calf. Thus a calf weighing 80 lb. would receive 6.4 lb. of milk per day. Milk feeding is continued until the calf is five to six months old, the amount given increasing with increase in weight of the calf.

The Roughage and Grain Requirement.—Young calves will begin to eat a little hay and grain when they are from three to four weeks old. They should have good-quality, fine, leafy hay, made from grasses or legume-grass mixtures rather than from legumes, placed before them when they reach the age of three weeks. A light, bulky grain mixture composed largely of oats and bran is an excellent grain ration with which to begin the grain feeding. They may be allowed as much hay and as much of such a light grain mixture as they care to eat. At six to eight weeks the grain ration may contain some corn or barley and a protein supplement along with the oats and bran. It may then be necessary to limit the grain to the amount the calves will clean up well in about a half hour's time after being fed their milk. An excellent grain mixture for young dairy calves from the time they begin eating to the age of six months may be composed of coarsely ground shelled corn or barley, 30 per cent, coarsely ground oats, 30 per cent, wheat bran, 30 per cent, and protein supplement, 10 per cent. Following dropping of the skim milk at the age of six months, dairy calves should be continued on the hay and grain ration until they are twelve months old. During this second 6-month period, a legume hay may be fed in place of the nonlegume or mixed hay, and a small amount of silage may be given, or if it is summer the calves may be turned to pasture. If the calves seem a little thin or slow in growth, the grain ration may be made heavier and richer by increasing the percentage of corn or barley and decreasing the percentage of oats and bran. The hay and grain feeding must be continued even though the calves are given the run of a pasture, since calves raised on skim milk will do very poorly on pasture as their only feed during the period between six and twelve months of age.

Substitutes for Milk.—When whole milk is sold as fluid milk or for cheese making, calves are sometimes raised with some

[1] Petersen, W. E., "Dairy Science," pp. 277, J. B. Lippincott Company, Philadelphia, 1939.

success by feeding milk for the first month or two, then feeding whey, butter milk, or calf meals in place of skim milk. For information concerning rearing calves without the use of skim milk, the reader is referred to specialized literature on the subject.

Feeding the Veal Calf.—Since less than 20 per cent of all dairy bull calves produced are needed as sires and only about 60 per cent of the heifers are needed for replacements in cow herds, a great many of the dairy calves born each year are destroyed at birth or marketed as veal. Correct feeding of the veal calf requires that it be fed liberally on whole milk as its only feed, either by nursing a cow or receiving whole milk from a pail from birth until it is marketed. Calves that are large at birth (70 lb. or more) generally can be profitably fed and marketed as veal. Small, poorly shaped calves require much milk before they reach veal weight, sell at a low price, and seldom show a profit. It is often good management to destroy such calves at birth rather than to feed them for veal.

Many dairy calves are fed skim milk and other feeds until they are from two to four months old and are then marketed. They sell as slaughter calves and are used in the veal trade but are sold as "calf carcasses" rather than as veal and sell at lower prices than veal.

Questions

1. State the valuable qualities of grass as a feed for dairy cattle.
2. How may permanent pastures be supplemented during poor grazing periods?
3. Why do high-producing cows need a concentrate feed while on pasture?
4. Give a suitable concentrate mixture for feeding high-producing cows on pasture.
5. How may the amount of concentrate to feed be determined?
6. What factors determine the kind and amounts of feed the milk cow should receive in winter?
7. Why is it important to know the mineral and vitamin content of the milk-cow ration?
8. Name the most suitable roughages for milk cows.
9. State the important rules in selecting suitable concentrate rations for milk cows in winter.
10. How should a dairy bull be cared for and fed?
11. How should yearling heifers and bulls be fed?

12. What are the most important requirements in the feeding of milk to the young dairy calf?

13. What dry feeds are best suited to young dairy calves?

14. How are veal calves fed?

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CHAPTER XVII

MANAGEMENT AND CARE OF DAIRY CATTLE

Profitable dairy farming in the United States is based on the large demand for milk, butter, cheese, and other dairy products for human food. As an average over the last 10-year period, about 25,000,000 milk cows have been maintained on about 5,000,000 farms to produce the supply of dairy products needed. The value of all products from dairy cows varies around $1,500,-000,000 per year. Besides the attractiveness of the market demand, the dairy cow appeals to many farmers because she is the most efficient of all farm animals in converting feeds and pasture into human food. In some instances dairying has the added advantage of offering an opportunity to market low-cost labor at a profit. This may be hired labor or the labor of members of the family.

Specialized Dairy Farms.—An appreciable percentage of the total supply of milk is produced on farms on which only from one to five cows are kept to provide the family supply of milk and cream or to provide a small supply of dairy product to sell. The bulk of milk to provide the commercial supply of all dairy products is produced on specialized dairy farms. The specialized farms are of several types, each presenting specific management problems, though many essential management methods apply to all dairy farms. Dairy farms are grouped into three types, based on the plan followed in marketing the milk, as follows: (1) farms producing market milk, (2) farms producing cream for buttermaking, and (3) farms producing milk for cheese making or for making evaporated, condensed, or dried milk. Breeding purebred dairy cattle might be listed as a fourth type of specialized dairy farm, though the farmer following any one of the three foregoing specialization plans may keep a purebred herd and add the marketing of breeding stock as an important source of income. In some instances, sale of breeding stock becomes the principal source of income. A fifth dairy-farming specializa-

tion plan might be mentioned, in which are included those farms keeping the dual-purpose type of cattle and marketing the calves produced as feeder or fat cattle rather than as veal. The dual-purpose dairy farmer may also breed purebred cattle and market breeding stock.

Equipment for Dairy Farms.—All dairy farms require as a major item of equipment a barn or shed large enough to house in single-tie stalls the number of cows it is desired to maintain in milk. Two general ground plans are in common use in the arrangement of stalls. For small herds it is the common plan to have one row of tie stalls for the cows the full length of the barn and a row of box stalls for housing the herd bull, the cows at calving time, the young calves, and growing stock. Where large herds of 20 cows or more are maintained, it is the common practice to run two rows of tie stalls the full length of the barn, then provide additional buildings for housing bulls, cows at calving time, and young growing stock. The tubular metal stall and tie stanchion are in general use in stabling milk cows. Many barns for housing loose animals have box-stall partitions of tubular metal also. This construction plan has to recommend it the sanitation it provides by permitting sunlight to permeate all parts of the barn, and it makes possible thorough washing and disinfection of the barn. Construction for warmth in dairy barns is essential, especially in the Northern areas, but provision for sunlight is also necessary as an aid to maintenance of health of the cows. Cement-floor construction and mangers of cement contribute to more complete sanitation. Many dairymen prefer that the cement floor on which the cows stand be covered with plank, wood blocks, or cork brick. Because the milk cow requires a large amount of drinking water and it is thought to be of advantage to have water before her all the time, the individual, automatic float-controlled watering system is provided in many dairy barns. A pressure water supply is essential to the use of the individual drinking-cup watering plan. Since dairy cows are in the barn a large part of the time in winter, a large amount of manure is produced in the barn. Overhead carriers are usually provided for removal of the manure. Carts are preferred for the feeding of silage and grain.

Dairy barns are usually built with large loft space for the storage of hay and bedding. One or more silos of sufficient

capacity to provide for the maximum need of silage for the number of cows to be kept are usually provided. The average milk cow will eat 2.5 to 3 tons of silage through a 6 months' winter feeding period. The typical silo 14 by 40 ft. holds approximately 125 tons of corn silage.

A milk room built a few feet distant from the barn and connected with the barn by a covered passageway should be provided in planning any dairy barn in which a considerable amount of milk will be produced. This room may house the cooling

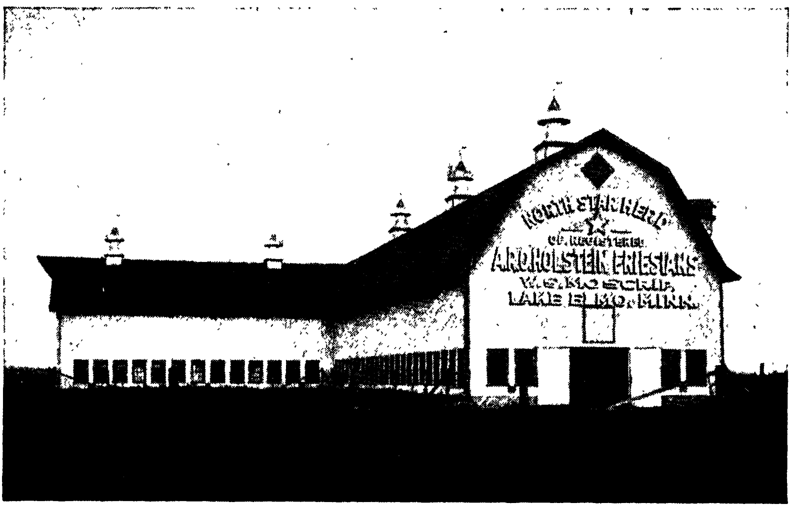

FIG. 34.—The dairy barn on the W. S. Moscrip farm, Lake Elmo, Minn. Note large overhead loft for feed storage and abundance of window space to admit sunlight on ground floor.

tank, the cream separator, bottling equipment, and equipment for washing utensils, as may be required according to the plan of marketing the milk that is followed. A small boiler for providing hot water for washing and steam for sterilizing utensils is an essential part of the equipment of the milk room.

A New Barn-arrangement Plan.—A plan for housing and milking the cows now being used on a few dairy farms and being tried out by a few experiment stations differs materially from the preceding. In the new plan a small milking room, especially equipped to promote sanitation in milking, is provided in one end of the barn. A few cows at a time are driven into this section of the barn, fastened in stanchions, milked, and turned

out, to be followed by others, until the entire herd has been milked. This room is used only for milking. The cows may be stabled and fed in other tie stalls or be allowed the run of a yard and shed for shelter. Under this plan it is not so essential that such strict sanitation be maintained throughout the entire barn. When it is followed the cows are allowed at liberty more of the time. They get more exercise, and it is thought that better physical condition and health of the cows may be maintained. The plan appeals especially to dairymen in warm

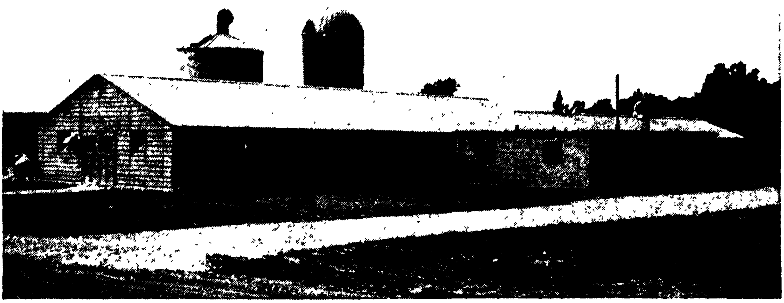

FIG. 35.—The University of Wisconsin "all metal" dairy barn constructed for experimental use. Milk room in foreground. Feed storage building in rear does not show in photograph. (*Courtesy of University of Wisconsin.*)

climates, where open sheds provide sufficient shelter and a large saving in original cost for shelter and a saving of labor in cleaning barns and care of the cattle may be affected.

It is common practice to equip the milking room or barn with a mechanical milker, though some dairymen prefer hand milking, especially of high-producing cows.

Management of the Market Milk Farm.—Several management plans differing materially in the procedure of handling the cattle are followed in market milk production.

Maintaining Cows Only.—On many market-milk farms, located on high-priced land in close proximity to large cities, cows are purchased wherever they can be secured as recently freshened or close-up springers. They are milked through one lactation period, sold, and new ones are purchased to replace them. This plan requires for equipment only a cow barn and

milk room with equipment for doing the milking and handling the milk. The milk is often sold to distributing companies and delivered in 10-gal. cans. Often there is little pasture acreage available, and most of the feed is purchased. Thus a minimum of equipment, land, and labor is required in proportion to the amount of milk produced. Profit is largely dependent upon the sale of the milk at a favorable price.

On some of the preceding types of market-milk farms, a herd bull is kept, and the heavier milking cows are bred. The selected cows are then retained for more than one lactation period. As calves are born the small, weak ones may be destroyed or sold at 1 to 3 days of age for a dollar or two. The large, strong ones may be marketed as veal at the earliest permissible age.

This plan of management of the market-milk farm is rapidly declining. It is difficult to make this type of farm pay a profit, and it is difficult to meet sanitary requirements when new cows are continually being added to the herd.

Maintaining Cows and Raising Heifers for Replacement.—This modification of the foregoing described plan of management for the market-milk farm is usually followed when the farm has a large enough acreage to provide pasture for the cows and growing heifers, even though the land is high-priced. When it is followed, better cows are maintained, and an attempt is made to secure and maintain a good herd bull. Bull calves and the heifers from the poorer producing cows are marketed as veal, and the better heifer calves from the higher producing cows are raised for replacements. This plan requires housing for the herd bull and growing heifers and additional feed and care for them. In return, it offers an opportunity to develop a healthier, heavier producing herd of cows. Milk and butterfat records for individual cows are often kept in such herds as an aid in culling the herd and selecting the heifer calves for replacements.

The Local Market-milk Farm.—This term is used to identify the management plan commonly followed on dairy farms that supply milk and cream and sometimes butter direct to the consumer in small towns and villages. It is the common method by which milk and cream are supplied to homes in villages, towns, and cities up to about 15,000 inhabitants. The management of this type of farm becomes considerably more complicated, because equipment for bottling milk, separating cream, and often

for churning butter must be provided. Labor must be added to do the extra work. Equipment for delivering must be provided and more labor added to do the delivering. If two or more farms are in competition for the trade in a small town, the one doing the most effective advertising and using the best sales methods is most likely to get the largest part of the business. Salesmanship is thus an added requirement of the manager of the local market-milk dairy.

Many local market-milk dairymen maintain purebred herds, and all that goes with the development and sale of breeding stock is added to the list of details of management requiring attention.

Management of the Cream Farm.—Selling cream for manufacture into butter is the marketing plan followed in the management of many dairy farms located throughout the North Central and Corn Belt areas. This is because these locations are too far from the large markets to permit of economical marketing of whole milk. The gross return when cream is sold for buttermaking is smaller than when whole milk is sold. Farms of the North Central and Corn Belt areas, on the other hand, have the advantage of lower priced land, cheaper labor, and lower production cost than prevails on most market-milk farms. The cream is sold to near-by local creameries or is taken to the shipping point for shipment. Some creameries provide trucks to collect the cream from the farms, or in some instances a group of farmers form a cream route and employ a trucker to collect the cream and deliver it to the creamery. Thus the labor requirement for handling and marketing the product is low.

When cream is sold, the skim milk remains on the farm and may be used to advantage in raising calves. There is usually a surplus of skim milk after all the calves produced are fed all they can use. A swine-raising or fattening enterprise or a poultry enterprise is usually added to the cream-marketing farm, since hogs and poultry can utilize the surplus skim milk as part of their feed to good advantage. Because they are generally located in areas where pasture and home-grown feeds are plentiful and because the skim milk is available for rearing calves, many farmers operating cream-producing farms keep purebred herds.

Management of the Farm Selling Milk for Cheese Making or Condensing.—Cheese factories and condensories are usually

located in areas favorable to low-cost milk production. The price paid for milk for these uses is usually low. Profit from this type of farm is dependent more on low cost of production than on a high price received for the milk. The operator of this type of farm need not hesitate to hold back milk for raising calves, since milk fed to good veal calves may return as high a price as milk sold.

Management of the Purebred Dairy Farm.—The milk or cream sold is always a major source of income from the farm on

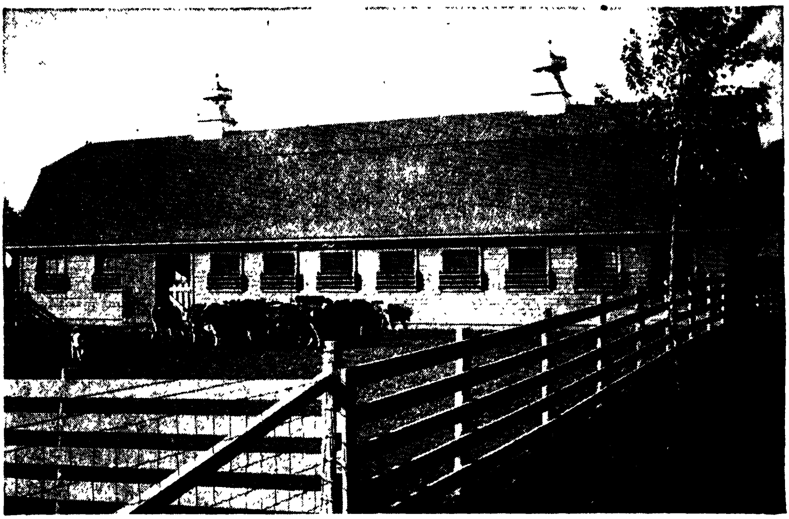

FIG. 36.—The calf barn at Boulder Bridge Farms, Excelsior, Minn. Well supplied with sunlight, well ventilated, and heated during winter months. (*Courtesy of Boulder Bridge Farms.*)

which purebred dairy cattle are maintained, just as it is from any dairy farm. All the requirements of sanitation in handling the milking and sale of the milk or cream are carried out just as on any dairy farm. The principal items added to the duties of the manager by the breeding of purebreds are (1) the extra attention and care he must give to the selection of breeding stock, (2) the extra attention he must give to the development of young growing stock, (3) the keeping of records essential to the registration of the calves, (4) the keeping of milk-production records, and (5) the attention he must give to the selling of surplus breeding stock.

Starting the Purebred Herd.—Any breeder of purebred cattle should start with the best breeding stock obtainable. If an entire herd of purebreds is purchased to begin with, the initial investment will be large. Many purebred herds are developed by starting with only a few outstanding purebred cows, the remainder grades, then replacing the grades with heifers from the purebred cows as they develop. The objection to this plan is that it is a slow way of establishing a purebred herd. The advantage is that only a small initial investment is required,

FIG. 37.—Interior view Boulder Bridge Farms calf barn. Note individual stalls for the younger calves. (*Courtesy of Boulder Bridge Farms.*)

and it is a safe way to proceed from the financial standpoint. Beginning with a herd of 20 cows, 16 of them grades and 4 purebreds, from 10 to 11 years will be required to reach complete replacement of the grade cows by purebreds raised in the herd.

Developing Young Stock and Keeping Records.—Young stock produced in the purebred herd must be well cared for and well fed so that it may develop to the full extent of its inheritance and so that it will present an attractive appearance to the prospective buyer. Developing young stock is a duty of the caretaker rather than of the manager. Likewise, keeping records of breeding dates, birth dates, marking calves for identification,

and keeping milk records are items of detail work for the caretaker rather than the manager.

The Selling of Breeding Stock.—One of the most important tasks of the purebred dairy-herd manager is the sale of the surplus stock. One of the principal objects of using purebred cattle on a dairy farm is to add to the income by selling cattle at good prices. To accomplish this objective, first of all good, useful cattle must be produced. They must then be advertised so that prospective purchasers will be attracted. Attracting the interest of purchasers of dairy cattle requires first that records of milk and butterfat production of the ancestry be kept and that they be included in the advertising and be available in tabulated pedigree form for inspection by the prospective purchaser. The registry associations, with the cooperation of state agricultural colleges, provide supervision of the keeping of official or semiofficial milk records. In high-producing purebred dairy herds, it is essential not only that records be kept by the owner but that they be supervised so that there will be no question as to their authenticity and accuracy. Most purebred breeders have official records made from their better cows only because cost of the supervision is too high to justify its use in moderate producing herds or for cows that will barely qualify for advanced registry. If a breeder enters the herd-test plan of record keeping, all purebred cows in the herd must be included under semiofficial test.

The second step in preparing for the sale of surplus stock, followed by many breeders, is the exhibiting of cattle at livestock exhibitions. Several advantages are gained from exhibiting. Through the presence of representative animals from a herd at one or more shows, many people see them, and the name of the exhibitor as a breeder becomes known over a large area. If the exhibitor has cattle good enough to win some prizes, the stamp of approval of the type and form of his cattle is thus placed upon his herd. If the breeder has kept production records, the publicity secured through exhibiting may be enough to attract sufficient purchasers.

Finally, in order to secure still wider publicity, broaden the market, and secure higher prices, many breeders advertise their herds and sale stock in farm papers and breed journals. Creditable production records plus show-ring winnings make the best

possible advertising copy. Breeders of dairy cattle are always in search of animals that combine approved type with high production. Some breeders advertise regularly in each issue of their breed journal; others, only when they have animals on hand that they wish to sell.

The auction method of selling is used to a considerable extent in selling purebred dairy cattle, just as it is in selling beef cattle. It is seldom that an individual breeder has a large enough number of animals to sell at one time to make a successful auction. Most dairy-cattle auctions are association or combination sales to which the animals are consigned by several breeders.

Management of the Dual-purpose Herd.—Successful management of the dual-purpose herd requires procedures identical with those that apply in dairy-herd management insofar as the milk product is concerned. The calves are raised on skim milk and are handled just as dairy calves are handled until they reach the weaning age. Following weaning they are handled as beef calves, and the same practices in management and care, feeding, and marketing as presented for beef cattle in Sec. II will apply.

The Care of Dairy Cattle.—Success or failure of any dairy enterprise is often determined by the care given the cattle. Profitable cows are often of thin-fleshed form and highly developed nervous temperament, not overly strong in constitution. To produce to their maximum capacity of milk and butterfat, such cows must be fed to the maximum capacity of their digestive systems. Knowledge of how to select, prepare, and place before the cow the right kinds and amounts of feed is an important responsibility of the caretaker. The milk production of many cows may be reduced by poor or careless milking. It is the responsibility of the caretaker to see that milking is done properly and regularly.

Dairy calves are often small and delicate at birth. They require skillful and careful feeding if they are to be raised. They require the unceasing vigilance of the caretaker. He must also be ever on the alert for any symptoms of disease or health trouble. Minor treatment of a cow for udder trouble, digestive disturbance, or injury must be rendered almost daily in a large dairy herd.

Care of the Herd Bull.—For the kind of care given the herd bull, the dairy-farm manager and the caretaker are both fre-

quently open to censure, the manager because he does not provide proper facilities for the care of the bull and the caretaker because he does not show sufficient interest in attending to the needs of the bull. The dairy bull is entitled to a box stall made strong enough to hold him and an exercise yard large enough so that he may get out in the sunlight and move around. If at all possible, this exercise yard should be large enough to provide pasture in summer. The feet of a bull kept under close confinement are almost certain to grow out and need to be trimmed. This is a simple operation for one who has had experience in doing it. The feet should be trimmed when they need trimming, even though a veterinarian may have to be employed to do it.

The Practice of Artificial Insemination.—Artificial insemination is a new procedure in animal breeding, contributed by research workers in the fields of animal genetics, physiology, and veterinary science. It is discussed at this point because dairy cattle seem to offer the largest opportunity for its profitable use. Its use involves management practice rather than selective mating or principles of breeding.

By the practice of artificial insemination many more cows may be mated to one sire than by natural mating. Cows may be mated to a sire located some distance away. The opportunity thus afforded may be of value to the owner of a large herd who would like to mate all his females to his one best sire. It may be of value to the owner of a small herd who would like to mate his females to a better sire than he can afford to buy and maintain. It is a simple matter for the large herd owner to employ a man or have one of his employees trained to carry out the work of artificial insemination. Instruments needed are few and simple and cost only a few dollars.

In order that artificial insemination may be used to advantage by dairymen owning only a few cows, it is necessary that a number of them combine in some type of organization through which outstanding sires may be purchased and maintained and through which the service of an operator to carry out the technical work of inseminating the cows may be made available.

A few large herd owners are now using this new procedure in the mating of the cows. A number of artificial-insemination breeding circuits have been organized and are operating successfully in various parts of the country. Management practice is

affected very little in the large herd because of the introduction of artificial insemination. The owner may use one or two fewer sires and as a result may buy better sires than he otherwise would. Management practice in the small herd is affected materially if the operator becomes a member of a breeding circuit. He may have his cows mated to a better bull and because of this find it desirable to raise more of the calves produced to be sold as breeding stock. He no longer need maintain a sire of his own, and besides being relieved of the investment in the sire and the work of caring for the herd bull, he has the saving of the feed required to maintain the sire. This may be used in maintaining an additional cow in the herd.

One of the principal handicaps to more rapid and successful development of artificial-insemination breeding circuits has been a failure on the part of the dairy farmer to appreciate the value of the service he receives by being a member of such an association. Persons organizing and operating such circuits have tried to meet this apathy on the part of the farmer by attempting to organize and operate on too small a service fee and with too few cows. Most associations are trying to operate on a fee of about \$5 per cow. Any dairyman might well afford to pay a fee of \$10 per cow when all the advantages of having his cows mated to a good bull by artificial insemination are considered.

Diseases and Parasites of Dairy Cattle.—Dairy cattle are subject to all the diseases, parasites, and ailments that affect beef cattle, as discussed in Chap. XI. Two disease conditions, mastitis, in cows, and calf scours, cause more trouble in the care of dairy cattle than with beef cattle.

Mastitis.—This is a term applied to a certain type of udder trouble in cows. The symptoms sometimes include swelling of a part or all of the udder and the giving of bloody or ropy milk. The milk may show abnormal composition without visible swelling of the udder. Although it is thought that bacteria or virus infections in the udder are the principal cause, it seems that the trouble may result from noninfectious causes, also, such as injury or careless milking. Applications of hot water to the udder several times per day is about the only treament that is advisable for the caretaker to attempt as treatment for mastitis. It will usually prove beneficial in cases resulting from a noninfectious cause. As soon as two or more cases of mastitis appear

in a herd at the same time or one closely follows another, a veterinarian should be called to diagnose and to prescribe treatment. Mastitis is the most troublesome disease problem in the care of milk cows. Many must be sent to market at early ages because their udders have been partly destroyed by the disease. Much research is under way in an attempt to locate the causes of the infectious type, and it is to be hoped that more knowledge concerning the disease will soon be available.

Calf Scours.—The condition known as "scours" in calves is familiar to every caretaker of dairy cattle. The calf that grows to the weaning age without an attack of scours from one cause or another at some time during the first 6 months of his life is the exceptional rather than the average calf. Scours are often caused by overfeeding of skim milk, by feeding from dirty pails, by feeding cold milk, by feeding soft green alfalfa hay, by turning to pasture, or by overfeeding of grain. This type of scours is noninfectious. It often appears in all the calves in a group at the same time because the same cause applies individually to all calves in the group. Prevention or cure of scours from the preceding causes can be accomplished only by removal of the cause. It is always advisable to cut down a little on the milk when the first symptoms of scours appear, regardless of the cause.

A more serious type of scours, caused by bacterial infection of the digestive system, is difficult to cure and requires careful administration of a strong intestinal antiseptic. Infectious scours is recognized by the grayish white or bloody condition of the feces and their strong odor. As soon as a case of infectious scours is suspected, the affected calves should be isolated from the others and a veterinarian called to make sure of diagnosis and to prescribe treatment.

Questions

1. What is the approximate number of milk cows in the United States? The number of farms on which milk cows are kept? The annual value of dairy products?
2. Name the three types of dairy farms as based on the plan followed in marketing the milk.
3. Name two additional management plans based on the kind of cattle kept.
4. What are the important equipment items required for the successful operation of a dairy farm?

5. Explain the new dairy-barn-equipment plan now being used on a few dairy farms.

6. Explain the procedure most commonly followed in securing the cows for the market-milk farm.

7. How does management of the farm from which cream is sold differ from management of the market-milk farm?

8. How does management of the cheese or condensed-milk farm differ from others?

9. What managerial duties are added by the use of purebred cattle in dairying?

10. How may one start a purebred herd?

11. How does the manager of the purebred dairy farm handle the selling of surplus stock?

12. What are the principal differences introduced by using dual-purpose cattle on a dairy farm?

13. State the more important duties of the dairy-cattle caretaker.

14. How may artificial insemination be used to advantage by dairy-cattle breeders?

15. What two diseases not commonly troublesome in beef cattle often prove especially troublesome in dairy cattle?

16. What precautions must the dairy-cattle caretaker practice in an attempt to avoid each of them?

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CHAPTER XVIII

JUDGING DAIRY CATTLE

Degree of conformance to a well-defined type, as determined by observation, is the starting point in valuing all dairy cattle, whether the object is to arrive at a sale price, to decide a show-ring rating, or to select animals for use as breeding stock. Performance records of the animal or its close-up ancestors are occasionally considered in arriving at a sale price and in show-ring judging. When available, performance records are nearly always taken into account in selecting animals for breeding use. Judging by observation must be relied upon as the basis for dealing in or selecting most dairy cattle for breeding use, because performance records are available for less than 10 per cent of all dairy cattle.

The Scale of Points.—Practice in scoring animals is the beginning point in the study of dairy-cattle judging. Dairy breeders make more use of the score card than do breeders of any other kind of farm animal. The registry associations for each of the pure breeds have set up a scale of points for the mature cow and one for the mature bull. Points of breed character are added to those essential in all dairy cattle. The breed score cards are used by expert judges in scoring animals in herds when the breeder desires to enter his herd in the herd-classification record maintained by some of the registry associations. Score cards for general use in scoring all dairy cows have been prepared by various agencies. The score for the mature dairy cow that is approved by the American Dairy Science Association is presented. It is recommended for use in teaching correct dairy type and form for cows of all breeds or for grade milk cows. On this score card, all points or characteristics are grouped under four headings as follows: (1) dairy form, (2) constitution, vigor, and condition, (3) digestive capacity, (4) milk-secreting organs.

A description of the correct appearance of each part included under each group heading is given on the score card. A pro-

Scale of Points for Dairy Cows
General Score Card

	Perfect Score
I. Characteristics indicating dairy form—35 points	
Head. Erect, clean-cut; neck slender; eye prominent, alert, and placid	3
Back. Straight and strong, hips wide apart and level	4
Rump. Long, wide, and level; thurls, wide apart and high; level tail setting	5
Legs. Straight; bone fine	3
General build. Rugged and large for the breed without coarseness; Jerseys 950 lb.; Guernseys and Ayrshires 1,100 lb.; Holsteins 1,350 lb	5
The cow should be clean-cut, with feminine appearance, absence of tendency to lay on fat	5
Shoulders, withers, vertebrae, hips, and pinbones. Prominent and free from fleshiness (period of lactation to be considered)	4
Loin. Wide; ribs long and wide apart	3
Disposition. Active, with good nerve control	3
II. Characteristics indicating constitution, vigor, and condition—15 points	
Chest. Broad and deep, with well-sprung ribs	8
Nostrils. Large and open	2
Condition. Thrifty and vigorous; in good flesh but not beefy	5
III. Characteristics indicating ability to consume and digest feeds—15 points	
Muzzle. Large; mouth broad	1
Skin. Mellow, loose; medium thickness showing good circulation and secretion; hair soft	4
Barrel. Deep, wide, and long; well-supported; ribs far apart	10
IV. Characteristics indicating well-developed milk-secreting organs—35 points	
Udder. *a.* Capacity. Large in size	7
b. Quality. Pliable, free from lumps	7
c. Shape. Extending well forward and well up behind; level on floor; quarters full and symmetrical	6
Milk veins. *a.* Large, long, crooked, and branching; milk wells large and numerous	7
b. Milk veins on udder crooked, numerous, and large	3
Teats. Convenient size; uniform and well placed	5
Total	100

Note: Score card approved by the American Dairy Science Association.

portinate score is assigned to each part. The object of scoring practice in teaching dairy-cattle judging is to lay the foundation for developing an image of the perfect animal in the mind of the beginning judge. This is accomplished by having the student score some animals as nearly perfect as are available and some that lack noticeably in a number of characteristics. The procedure is the same as in scoring beef cattle, but the scale of points, descriptive terms, and emphasis placed on different parts

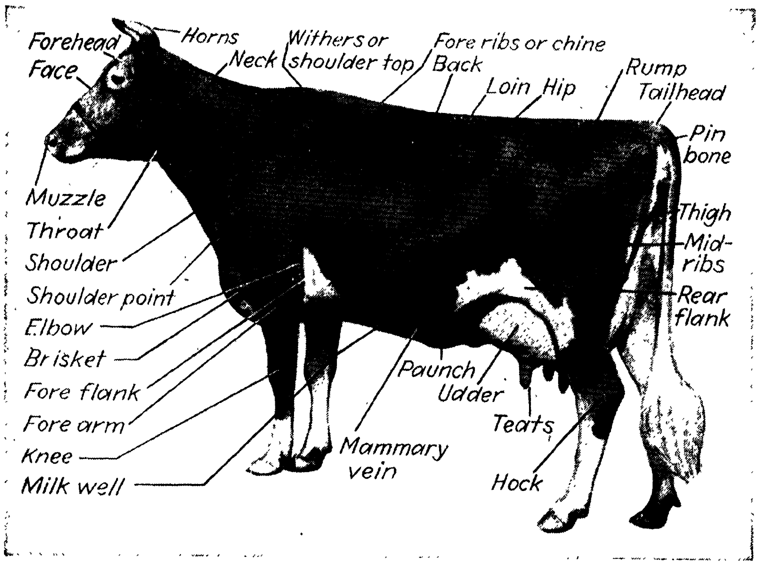

FIG. 38.—Showing location of parts of the dairy cow.

are very different. It is not unusual to hear an expert judge of beef cattle state that he knows nothing about judging dairy cattle or to hear a dairy judge say that he knows nothing about judging beef cattle.

Just as the fat steer sets the standard from which all beef cattle are judged, so the mature cow in milk sets the standard for all dairy cattle. Beef cows and beef bulls vary in a number of characteristics from those of the fat steer but beef cows and bulls are always judged on the basis of the kind of a fat steer they might be expected to produce. Dairy heifers and dairy bulls differ materially in many characteristics from mature cows, but heifers are judged from the basis of the kind of cow they will

make when mature, and bulls are judged on the basis of the kind of cows they might be expected to sire.

Judging Dairy Cows.—Although a careful study of the score card should give the beginning judge a clear picture of the perfect dairy cow, a statement of the reasons for some of the requirements may help to form more quickly the correct image.

Dairy Form.—The form as described on the score card calls for a cow that is sharp at the withers and that widens downward to the shoulder points and also backward to the hips, thus forming a wedge-shaped appearance downward over the shoulders and backward to the hips. This is the body shape that makes for a strong skeletal frame without the development of a thick muscle covering over the shoulder top, foreribs, back, and loin. This leanness of form or absence of thick muscle development is thought to reduce the tendency of the cow to deposit fat on her own body and thus leave a larger part of the nutrient supply of the feed eaten to be manufactured into milk. The cow that is to carry a large well-shaped udder must be wide at the hips and carry this width uniformly through the rump to the pinbones, with rear legs set moderately wide apart. Along with the wedge-shaped appearance and strong rear quarter the cow may and should have a straight top and underline, a neat, attractive-appearing head, a slender neck, and a proportion of parts that produces a symmetrical, attractive appearance rather than a rough, unbalanced appearance.

Constitution.—An appearance of vigor and good health is in itself an indication that an animal has a strong constitution. An appearance of good depth at the chest and good width at the floor of the chest indicates further that the cow has room for a large heart and lungs and should be strong in constitution.

Feeding Capacity.—Wide-sprung ribs, width at the loin, and the appearance of depth in the body, particularly at the rear flank, are taken as indications that the cow has a large digestive system and should have capacity to consume and digest the large amounts of feed needed to produce a heavy milk flow.

Mammary System.—In the score for the dairy cow, 35 points out of the 100 are assigned to the udder, milk veins, and teats. It is easy to note by observation that those cows that produce large amounts of milk have large, well-formed udders, whereas cows with small, poorly formed, or fleshy udders are never heavy

milkers. The large, well-formed udder is essential to the manufacture of a large amount of milk.

The large veins one on each side of the abdomen running forward from the udder and entering the body between the navel and foreflank are called "milk veins." They do not carry milk, as the term might suggest, but carry the blood from the udder back to the heart. The openings through the body wall through which the milk veins enter the body are called "milk wells." The veins and openings are called "milk veins" and "milk wells"

Fig. 39.—The Holstein-Friesian cow, Cornell Ollie Catherine. A high producer and near ideal in dairy type. (*Photograph by Strohmeyer and Carpenter.*)

because their size is an indication of high or low milk production. Large veins and large wells are usually found in high-producing cows, and small short veins and small wells are usually found in low producing cows.

The teats of the cow are of considerable importance, because they affect ease of milking. Teats that are too large and muscular, teats that are too short and small, and irregular-sized teats all make for difficult milking, either by hand or machine.

Judging Dairy Heifers.—A score card for the dairy heifer would place more emphasis on form and less on the mammary system than the cow score card. Form of the young heifer is a

better criterion of probable productive capacity at maturity than is the undeveloped mammary system. Expert dairy judges give some attention to the placement and size of the undeveloped teats as well as to the appearance of space for udder development when the heifer freshens. In judging purebred heifers, breed characteristics enter in for consideration and may be an important influence on value or desirability.

Judging Dairy Bulls.—Form, constitution, and feeding capacity are of major importance in judging dairy bulls. Leanness of form and development of rear quarters similar to those characteristics in the cow are desired. Dairy bulls are not expected to be as sharp at the withers as cows, though undue width and thickness of muscle covering over the top of the shoulder and foreribs are objectionable. Depth of body and width at the floor of the chest, width at the hips, and depth at the rear flank are indications of strong constitution and large feeding capacity. Breed characteristics are emphasized in judging purebred bulls.

Comparative Judging.—Practice in comparative judging of several animals serves the same purpose and is used in the same way in teaching dairy-cattle judging as in teaching the judging of beef cattle. The more of it a beginning judge can do under the direction of a competent instructor the more quickly will he gain confidence and accuracy in evaluating the individual animal.

Aids to Observation in Selecting Dairy Cattle.—After every effort to develop proficiency in judging dairy cattle by observation has been made, the fact still remains that a thorough study of all visible characteristics of a dairy animal fails to provide a highly accurate means of evaluating the producing ability or reproductive ability.

Importance of Ancestors and Progeny.—In the judging of purebred dairy cattle for breeding use, selection by observation is supplemented by reference to the pedigree and consideration of the ancestors from the viewpoint of their conformance to the desired breed characteristics and to the desired form and appearance. When available, progeny is considered in the same way. Show-ring winners have been chosen as animals bearing the approval of the most expert judges.

Milk and Butterfat Records.—Early in the history of dairy-cattle improvement by breeding, dairymen discovered that the only means of accurately determining the amount of milk and

butterfat a cow would produce was to keep a day-to-day weight record of the milk and to make a test of the percentage fat content at intervals not exceeding 1 month. Two problems arise in the keeping and use of milk records. One is the work involved; the other is how to evaluate the records. The first problem is easily solved by a determination on the part of the breeder to go ahead and keep the records. Their availability and use by the breeder in determining which cows to keep will pay a large return for the extra labor, even in the grade herd.

The value of records as an aid in the purchase of a herd bull or females depends first of all on their accuracy. To remove any doubt as to the accuracy of records, the purebred registry associations maintain close supervision of the testing of the cows. This is accomplished by cooperation with the state agricultural colleges. Generally, through their dairy departments, the state agricultural colleges provide supervisors who visit the farms of the breeders and remain there 2 days each month to observe the milking and weigh the milk produced during one 24-hr. period. The tester takes a sample from each milking and makes a determination of the fat it contains. This procedure guarantees a high degree of accuracy of official or semiofficial milk records, as they are then called. The breeder must pay the cost of supervision. This makes the keeping of records expensive unless the breeder has a considerable number of cows to be tested. Many small breeders would like to carry on official testing but feel they cannot afford the expense. This need not stop them from keeping their own records and using them in making selections from their herds for retention as breeding animals. If the breeder has a reputation for dependability and honesty in his community, he will find that his own private records will be given considerable weight by prospective purchasers who come to buy breeding stock.

Many factors besides accuracy must be taken into account in judging the value of a milk record as a guide in the selection of breeding stock. If a daughter produces more milk than her dam at similar ages, it is considered that she is an improvement over her mother. It is, however, possible that the daughter received better feed and care than her mother and that under the same conditions of feed and care she would produce less than her mother. Likewise, the ability of a bull to sire high milk pro-

duction can only be considered proved when he has sired several daughters that have excelled their dams in production under similar feeding and care. Production records are most reliable when all the animals in the first three generations of ancestors have high records.

Before milk and butterfat records can be used to advantage as an aid to selection, the records must be judged for accuracy and conditions of feed and care under which they were made. The accuracy of official and semiofficial records is safely guarded by the registry associations. When a breeder spends the money for supervision of records it may be taken for granted that he will feed and care for the cows to the best of his ability. It may then be concluded that nearly all milk records are made under good feeding and care and can be considered as a reliable indication of the maximum producing ability of the cow.

When available, milk and butterfat records are a valuable aid in the selection of dairy cattle by observation. There are several reasons why they cannot successfully be substituted entirely for observation. (1) There is too much of a tendency for a herd of cattle to lose its breed type, its uniformity, and the correct dairy form in individual animals in the herd when no attention is given to these characteristics. More serious is the probability that in time selection based on production alone will emphasize mammary development and nervous temperament to the point where constitution and digestive capacity will be overtaxed in trying to meet the demands of the mammary system, and this will lead to a breakdown in the health of the cow. (2) The greatest weakness of milk records as a guide to selection is that they do not take into account the feed consumption of the cow. Were such information available, more reliance might be placed on the combined feed-consumption and milk-production record, since this would more accurately portray the true efficiency of the cow. It is not to be expected that feed records will be available for many cows, because it is too expensive to keep them. The production record must, therefore, be valued as an indication of probable inheritance carried by the animal rather than a guarantee of certain inherent ability. (3) At present, production records are available for less than 10 per cent of all dairy cattle. Until record keeping becomes more general, most dealing in dairy cattle and much selection of animals for breeding use must

be based on observation entirely, because the animals under consideration or their ancestors have no production records.

MARKETING DAIRY CATTLE

When sold for beef or veal, dairy cattle go into the same channels as beef cattle. An occasional animal of dairy breeding may be found on the large markets in almost any grouping of cattle on the basis of class, subclass, and grade, as provided for beef cattle. A large majority of all dairy cattle that find their way to the large markets fall into one of four classes: (1) milker and springer cows, (2) slaughter cows, (3) slaughter bulls, and (4) veal calves.

Dairy Cattle at the Large Markets.—In every large market will be found from one to three or four dealers who specialize in and handle nothing but milk cows recently freshened or soon due to freshen. Such cows are purchased by the dealers out of the commission firm pens by the head rather than by weight and are sold by the dealers by the head. The grade terms "choice milker" or "springer," "good milker" or "springer," etc., are used in quoting market prices for them. The principal buyers of such cows on the markets are men who operate market-milk farms by the plan of buying cows and selling them again after one or two lactation periods.

Dairy cows arriving at the market showing that they are dry or nearly dry and apparently not soon due to calve sell as slaughter cows. They are generally in thin flesh and fall in the two lowest grades of slaughter cows, cutter and canner.

Nearly all bulls of dairy breeding fall in the class for slaughter bulls. They are generally in thin flesh, and their carcasses are especially desirable for sausage making because of the absence of excessive fat. Prices received for them often compare favorably with prices paid for bulls of the beef breeds.

As stated earlier, nearly all calves that find their way to market at the veal age are of dairy breeding. The value of the veal calf depends on its form, condition, weight, and age, particularly since age may indicate the feeding of some feeds other than milk before marketing.

Local Dealers.—In densely populated dairying communities a local milk-cow dealer is often found. The local dealer owns or rents a farm or at least a barn. He then buys cows as oppor-

tunity offers. If there is a shortage of cows in the community he may bring some in by the carload from a distance. He milks and cares for the cows until a buyer is found. He may own some of the cows several weeks or even months before they are sold. When the demand is strong, he may conduct weekly auctions. The principal buyers are market-milk producers and persons who keep only a few cows and pay no attention to record keeping and very little to the breeding of the cows they buy.

Selling Purebreds.—The breeder of purebred dairy cattle, like breeders of all other kinds of purebred livestock, must find the buyers for his surplus animals. There is no organized channel through which he may sell them on the basis of their breeding worth. As explained in Chap. XVII, under Management, buyers are found through several methods of advertising. Auction sales are frequently used as a selling method.

Questions

1. Why is judging by observation of importance in evaluating dairy cattle?

2. State the four headings under which the points considered in judging dairy cattle are grouped.

3. Why is the cow in milk used as the standard in judging all dairy cattle?

4. Describe the requirements of correct form for the dairy cow.

5. What characteristics indicate a strong constitution?

6. What characteristics indicate a large capacity to consume and digest feed?

7. Describe the standard characteristics of the milk-secreting organs.

8. How does emphasis on certain characteristics in judging dairy heifers differ from emphasis placed on the same characteristics in judging cows?

9. How may milk and butterfat records be used as an aid to observation in evaluating dairy cattle?

10. Outline the procedure followed in keeping official and semiofficial milk and butterfat records.

11. Why is it not advisable to depend on butterfat records alone in selecting dairy cattle for use as breeding animals?

12. Into what market classes do most dairy cattle fall when sold on the large markets?

13. What service is rendered by milk cow dealers?

14. How are purebred dairy cattle sold?

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SECTION IV

Swine Production

CHAPTER XIX

THE PRODUCTS AND ADAPTATIONS OF SWINE

For many years the hog has supplied meat and lard, two important food products, to man. The hog has supplied these two high-quality food products so efficiently that he stands second only to cattle in the tonnage of meat contributed annually to the food supply of the world. Pork possesses some advantages over beef as a food, and except that the hog is much more limited in his adaptations to production, it is probable that a larger amount of pork than beef would be consumed. In those countries favorable to swine raising, consumption of pork usually slightly exceeds consumption of beef.

The hog is the most efficient of all farm animals in converting pounds of feed into pounds of meat, but because of his small, simply constructed digestive tract, he can use only the seeds and concentrated parts of plants that are low in fiber content and high in digestible nutrients. Where such feeds are available at low cost, several characteristics of hogs favor their economical production as compared with other farm animals. The most important of these factors are (1) The capital investment for equipment and breeding stock is low in proportion to gross returns. (2) Returns on the initial investment in breeding stock and equipment are secured in a comparatively short time. (3) The hog is the most efficient of all farm animals in converting concentrate feeds into meat.

The Qualities of Pork.—Pork stands in high favor as a human food because of (1) its taste appeal, (2) its high nutritive value, (3) its health-giving quality, and (4) its suitability to curing and smoking, which enhances its taste and its keeping quality.

Taste.—The many ways in which different cuts of pork may be prepared for eating, the desirable flavor produced by curing and smoking, and its attractive natural flavor give pork a broad taste appeal. Pork fat is the finest in texture, most tasty in flavor, and most easily digested of all the animal fats except butter. Thus the fat gives pork flavor and added value. Pork and lard are used extensively in cooking to give flavor and richness to many other food products, notably cooked vegetables.

Nutritive Value.—The flesh of the hog is composed almost entirely of protein compounds, fat, and water. The hog has a natural tendency to develop a higher percentage of fat as it grows and matures than is the case with cattle. As a result, even when slaughtered at a rather early age, the carcass of the hog is high in protein and fat and medium in water content as compared to most beef carcasses. These characteristics make pork one of the richest, most easily digested, and highest in nutritive value of all food products.

Health.—The wide variety of amino acids it contains, its high fat content, its palatability, and its high digestibility are the qualities that make pork a highly nourishing and consequently healthful food.

Cured Pork Products.—Although the curing and smoking of pork do not add to its nutritive or health-giving value, they do improve its taste and consequently strengthen its favor with the consumer.

Per Capita Consumption.—The annual per capita consumption of pork varies widely in different countries of the world because of its availability, cost, the taste preference of the people, and in some instances because of religious beliefs that bar the use of pork as food. Since corn or the cereal grains and their by-products constitute the principal feed for hogs, hog production has developed most extensively in those regions of the world that produce corn or the small grains most economically. In these countries or regions pork consumption is highest, whereas in those countries without corn and a low production of cereal grains, pork production and consumption are low. A surplus of pork may be produced in areas favorable to its production, and this surplus may be transported to other areas, but it is then high in price, and often beef, mutton, and lamb are relatively cheaper meats. Consequently their consumption is high and pork consumption low.

In the United States pork production has centered in the Corn Belt region, with the Southeastern states constituting a rather important second producing area. The development of the large pork-packing companies, with their far-reaching distributing systems, has made pork products readily available in every part of the country at costs that vary from those in the heavy producing areas only as transportation of the product necessitates.

The adaptability of pork to home slaughter, curing, and storing on the farm has led many farmers throughout the country to raise a few pigs, slaughter them, and cure the meat themselves. Although the raising of the pigs under more or less unfavorable conditions may force the cost of the live hog a little higher than it would be in more favorable localities, the farmer in the state of Nevada, for instance, who raises and slaughters his own hogs, even though feed costs are high, may save all the marketing, processing, and retailing costs, and his pork and lard supply may cost only about 60 per cent as much as it would if he did not raise hogs and purchased the products from the retail-meat dealer. This adaptability of pork to home slaughter and storage is responsible in considerable measure for a high consumption of pork by rural families and contributes materially to the high total per capita consumption.

During the last hundred years, pork consumption in the United States has varied from a minimum of about 50 lb. to a maximum of about 80 lb. per person per year. In 1938 per capita consumption was 57.1 lb.[1] Total hog slaughter to produce this pork was about 40,000,000 head.

Lard.—In fattening, the hog deposits a thick covering of clear fat over the entire outer surface of his body and also a thick lining of fat on the inner surface of the abdominal cavity. In processing the carcass, this internal fat is stripped from the ribs, and much of the external fat is trimmed from the external covering. This fat is "rendered" or melted by heating, and the clear, liquid fat is pressed and drained from the connective tissues. This rendered pork fat is called "lard." It is used in many ways in cooking other foods and in baking.

Until vegetable oils began to be substituted for lard, it was the highest selling product per pound of the entire hog carcass.

[1] *U.S. Dept. Agr. Market Statistics*, 1939.

Extensive substitution of vegetable oils for lard in the United States and the loss of most of the export market have reversed the price of lard so that it is now the lowest selling product of the hog carcass. Recently developed new processing methods may reinstate lard in greater favor with the consumer in the near future. During the last hundred years, consumption of lard in the United States has varied from a low of about 10 lb. per capita per year to a high of 15 lb. In 1938 consumption was 11.3 lb. per capita.[1] To a considerable extent lard is a by-product of hogs. This is especially true under present prevailing low prices. The aim in raising hogs is to produce that type of hog which will supply the highest percentage of lean meat and the lowest percentage of lard commensurate with high quality in other pork products.

By-products from Swine.—The hog has the highest dressing percentage of all farm animals. This is due to the thick body wall, the small digestive tract, with consequent small amount of offal, and to the practice of leaving the skin, legs, head, and ears on the dressed carcass. The dressed weight varies from 70 to 85 per cent of the live weight. The average is about 77 per cent. Most hogs fall between the range of 70 to 80 per cent dressed weight. Most of the by-products of hog slaughter are edible products, such as the heart, liver, kidneys, sausage casings, and fat stripped from the intestines. The blood, lungs, and viscera are made into tankage and other animal-food products. The content of the digestive tract is about the only waste material. Even the hair is used for bristle in brush manufacture. The total value of the inedible by-products from hog slaughter amounts to only about one-half of 1 per cent of the total carcass value.

TABLE XI.—PRICE OF HOGS PER 100 LB. LIVE WEIGHT RECEIVED BY FARMERS, 1929–1938*

1929	$9.42	1934	$4.14
1930	8.84	1935	8.63
1931	5.73	1936	9.30
1932	3.34	1937	9.47
1933	3.53	1938	7.72

* *U.S. Dept. Agr. Market Statistics*, 1939.

[1] *U.S. Dept. Agr. Market Statistics*, 1939.

Table XI cites the average price received per 100 lb. live weight for hogs through the period 1929–1938. The table shows the wide variation in price over a period of years, and in this instance the complete cycle from the high point of 1929–1930 to the next high point of 1936–1937 is about 7 years.

Adaptations of Swine.—Because the mature breeding stock, the growing pig, and the fattening hog all require much the same kinds of feed, the complete process of raising and fattening hogs is commonly carried out on the same farm. There is no extensive two-phase production, as with beef cattle.

Swine Production in the Corn Belt.—Early in the development of corn growing in the central Mississippi Valley region, it became evident that corn was a hog feed par excellence. The combination of the suitability of this vast area to the successful growing of corn and the suitability of corn as the principal feed for hogs brought about the development of this region not only as the greatest corn- and hog-growing area but also as the most prosperous agricultural region of the world. The area comprises all of Ohio, Indiana, Illinois, Missouri, and Iowa and parts of Kansas, Nebraska, South Dakota, North Dakota, Minnesota, Wisconsin, and Michigan. It is known throughout the world as the Great American Corn Belt.

Whereas in the past many Corn Belt farmers have specialized in hog raising to the exclusion of all other kinds of farm animals, and some still do, it is doubtful if such complete use of the land for corn and hog production will prove the most profitable management plan over a long period of years. Even the rich soil of the Corn Belt will be depleted rapidly by the continuous growing of a crop that takes so much out of the soil each year. The raising of hogs to the full capacity of all Corn Belt farms would also result in such tremendous production of hogs that a profitable market for them could not be found.

The Hog and Beef-cattle Combination.—Farmers of the American Corn Belt long ago learned the advantages of combining beef-cattle raising or the fattening of thin purchased cattle with the raising of hogs. The beef cattle utilize any untillable pasture land to advantage, also legume hay crops grown for soil improvement, the fodder from the corn crop, and part of the corn itself, leaving a good part of the corn to form the principal feed for a limited number of hogs. The hogs complement the beef cattle by

utilizing the surplus corn and, to a minor extent, by salvaging waste corn from the droppings of fattening cattle. Neither beef cattle nor hogs are excessive in their equipment or labor requirement. The largest labor requirement for their care comes during the winter and early spring months, thus releasing most of the labor for attention to the field work during the crop-growing and -harvesting seasons.

The Hog and Dairy-cattle Combination.—On Corn Belt farms where dairy cattle are maintained and the cream is sold, hogs have much the same adaptation as with beef cattle, but in a more limited way. In the maintenance of a dairy herd a considerable acreage will be required for pasturage, the production of hay, and some oats. Part of the corn crop is required for silage, and the surplus of corn for hog feeding is limited. The skim milk, however, is a valuable protein supplement for the hogs, and they supplement the dairy enterprise by converting the skim milk into a salable product. On such dairy farms sufficient hogs to utilize the skim milk should be raised. On dairy farms in the Corn Belt from which whole milk is sold or on dairy farms outside the Corn Belt, it is doubtful if there is any great advantage to be gained by combining hog raising with dairying.

Swine Production in the Southern States.—The Southern states have always raised an appreciable number of hogs but not enough to supply their own needs. For many years satisfactory profits from cotton and tobacco growing limited interest in swine raising. Lower prices for cotton and tobacco during recent years are causing farmers of the Southern states to search for other crops and farm-management plans that will prove more profitable. The use of peanuts, sweet potatoes, soybeans, velvet beans, cottonseed meal, and cane molasses, with some corn and small grain as feed for hogs, is bringing about a marked increase in hog raising in this region. Heavy feeding of peanuts and soybeans is known to produce "soft pork," and peanut- or soybean-fed hogs are discounted in price as much as 25 per cent. Even so, peanut-fed hogs have a characteristic flavor that meets with special favor at some of the Eastern markets.

Salvaging Garbage with Hogs.—The hog has a minor adaptation to production near large cities where the garbage from the city forms a cheap and fairly satisfactory feed. Garbage feeding requires special sanitation and care and has proved most success-

ful and profitable when conducted on a large scale with highly skilled men in charge to supervise closely the feeding and care of the hogs. At some garbage-feeding plants, breeding stock is maintained, and pigs are raised. At others, feeder pigs are purchased and fattened. By feeding a limited amount of corn or other concentrate feed, pigs raised largely on garbage can be finished to produce a satisfactory quality of pork. The Fontana Farms garbage-feeding plant near Pomona, Calif., is probably the largest and most successful garbage-feeding plant in the United States. On this farm thousands of pigs are raised and fattened annually on garbage from Los Angeles and other southern California cities.

In recent years other uses being developed for garbage, notably its manufacture into lawn, greenhouse, and garden fertilizer, are reducing the amount of garbage available for hog feeding.

TABLE XII.—HOGS ON FARMS, JAN. 1, 1939*

Corn Belt region	Thousands	Southern states	Thousands
Ohio	2,737	Virginia	683
Indiana	3,405	West Virginia	217
Illinois	4,423	North Carolina	1,155
Michigan	713	South Carolina	583
Wisconsin	1,454	Georgia	1,554
Minnesota	2,737	Florida	566
Iowa	8,179	Kentucky	1,167
Missouri	3,120	Tennessee	1,154
North Dakota	311	Alabama	1,195
South Dakota	849	Mississippi	1,189
Nebraska	1,998	Arkansas	1,238
Kansas	1,045	Louisiana	909
		Oklahoma	954
		Texas	1,820
Total	30,971	Total	14,384

Total, United States	49,011,000
Total, Corn Belt region	30,971,000
Total, Southern states	14,384,000
Total, all other states	3,656,000

* Estimated. Calculated from *U.S. Dept. Agr. Market Statistics*, 1939.

Opportunities to Increase Hog Production.—People in the United States now consume an immense amount of pork and lard

each year. In 1938 per capita consumption was 57.1 lb. of pork and 11.3 lb. of lard. The total amount of pork consumed was about 7,423,000,000 lb. and 1,469,000,000 lb. of lard. A larger market for pork and lard might be developed in either or both of two ways: (1) by increased consumption at home or (2) by developing an export trade. Increased prosperity might lead to some increased consumption at home. A return to the greater use of lard in cooking would raise the price of lard and thus help the hog raiser. It is doubtful, however, that any considerable opportunity for increased demand for hogs will come from any marked increase in consumption of pork or lard at home.

From 1880 to 1930 hog raisers of the United States had the benefit of a rather large export outlet for pork and lard, principally to Great Britain and western European countries. This export outlet absorbed from 10 to 15 per cent of the hogs produced. Since 1930, however, this export outlet has closed entirely, and practically no hog products are now being exported. The loss of this export trade in pork and lard was an aftermath of the First World War. It was due to increased hog production in the western European countries to the point of self-sufficiency in hog products. There seems to be no probability of an immediate revival of any considerable export trade, though such a revival as a result of the Second World War is possible.

There is the possibility of some shift in production from the Corn Belt to the Southern states, but this will have little influence on total consumption and consequently cannot be considered an opportunity for increased production in the country as a whole.

Possible Sources of Future Competition.—The two most likely sources of future competition for present-day swine raisers in the United States are (1) competition from other farm animals and (2) competition from imported pork and lard.

Competition from Other Farm Animals.—Although it is true that because of his efficiency in converting corn into meat the hog has first preference among all farm animals for production in the Corn Belt, he must compete with poultry, dairy cattle, beef cattle, sheep, horses, and mules for the use of the land and for the corn. If any of these types of farm animals prove more profitable than hogs over a period of a few years, their production will be increased and hog production decreased. At present, however, the markets for the products of all other farm animals seem to be

about as fully supplied as the market for hog products. In other words, a balance of production with consumption of the several kinds of farm animals in the United States seems to have been reached, and changes in numbers of any kind of animal will be made rather slowly in the future. The hog, therefore, is not likely to experience any more severe competition from other farm animals than he has for a number of years.

TABLE XIII.—EXPORTS AND IMPORTS OF HOGS AND HOG PRODUCTS, 1890–1938
Decennial Years* Only

Year ending June 30	Exports			Imports		
	Live hogs, 1,000 head	Pork, 1,000 lb.	Lard, 1,000 lb.	Live hogs, 1,000 head	Pork, 1,000 lb.	Lard, 1,000 lb.
1890	91	688,559	471,084	2	261	2
1900	51	876,211	661,814	2	312	8
1910	4	344,182	362,928	2	655	4
1920	36	1,151,253	610,427	4	2,820	746
1930	18	334,645	803,943	3	6,186	2
1938	0	79,242	190,100	28	64,875	7

* *U.S. Bur. Agr. Econ. Marketing Service Statistical Report*, 1939, p. 39.

Competition from Imported Pork and Lard.—A number of foreign countries are producing all the pork and lard they consume and some for export. For several years preceding the outbreak of the Second World War, in 1939, Canada, Brazil, and a number of European countries were in a position to export pork and lard to the United States. Some pork products were imported from Canada and such countries as Poland, Hungary, and Austria.

Pork products have not yet been imported from Brazil or the Argentine, but both these countries are potential future competitors for the pork and lard market in the United States. Tariffs have in the past helped to limit competition from foreign countries. The amount and severity of competition American pork producers may have to meet from imported products in the future may depend to a large extent upon the import regulations and tariffs imposed by the American government.

Questions

1. Name the important products of swine.

2. What factors determine the proportionate consumption of pork and beef?

3. State the specific economic advantages of the hog as a kind of farm animal to raise.

4. State the qualities of pork that make it a popular item of food.

5. What is the approximate per capita consumption of pork in the United States? Of lard?

6. What is the approximate number of hogs slaughtered annually in the United States?

7. Why are hogs commonly slaughtered and processed on the farm for home consumption?

8. Why are the raising and fattening of hogs generally completed on the same farm?

9. What are the advantages of raising beef cattle and hogs on the same farm? Dairy cattle and hogs?

10. Upon what circumstances will a possible increase in profitable hog production in the United States depend?

11. What may be sources of possible future competition for hog production?

12. What has been the significance of exports and imports of pork and lard to swine producers in the United States?

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CHAPTER XX

SWINE BREEDING

Authentic history affords meager information concerning the origin of the hog. A type known as the "wild hog of Europe" is considered to be the immediate progenitor of the swine of Europe and America of today. It is thought that swine existed in China at least as early as the wild hog existed in Europe. It is possible that China may have been the location of the earliest development of the hog and that the wild hog of Europe is a descendant of the Chinese stock. Chinese hogs were taken to Europe and influenced improvement of European stock after domestication of the hog in Europe. The foundation stock for the raising of hogs in America was brought to the Western Hemisphere from European countries. It is thought that some Chinese hogs were brought from Europe or possibly directly to America from China and intermingled with at least part of the hog stock in America during the earlier years of hog raising in this country.

Origin of Types.—Little is known about the appearance or type of the hogs first imported by the North American colonies. Authentic history of the development of hogs in the United States begins with the formation of the pure breeds. Only vague descriptions of the appearance and characteristics of the hogs that formed the foundation stock of the several American breeds are recorded in the history of these breeds. With the exception of one or two breeds imported directly from Great Britain and kept pure in their breeding following importation, the pure breeds of swine in America today are of American origin so far as their recognition as breeds is concerned.

It is the commonly accepted belief that the early hogs imported from Europe were of large size, coarse in bone, hair, and ear, inferior in form, as judged by present-day standards, and varied in color, including reds, whites, blacks, and all degrees of spotting of the three colors. It is likewise generally believed that the hogs of Chinese origin were small, refined in bone, hair, and ear, and

bore a little more resemblance in appearance to the modern hog.

In the improvement of hogs, two rather distinct types have been produced, the one reaching its greatest degree of perfection in Great Britain and the Scandinavian countries, known as the "bacon" type, the other reaching its highest degree of perfection and popularity in the American Corn Belt, known as the "lard" type.

The Lard Type.—From the beginning of swine production in America down to recent times, lard was the highest priced product of the hog. Heavy feeding of corn is conducive to the formation of fat in any animal. It was but natural that the swine breeder of the American Corn Belt should capitalize on this combination of an important economic advantage with an important natural advantage by choosing as his ideal a hog type favorable to efficient utilization of feed in fat formation. Beginning with the large, coarse hogs of 100 to 150 years ago, several American breeds have been developed, each possessing minor distinguishing breed characteristics but all possessing essentially the same body type. During the formative period of the breeds, this type was described as proportionately wide and deep in body, medium to short in length of body, short and fine in the legs, and short and neat in the neck and head. Hogs conforming to this body form came to be classed as the lard type regardless of their breed identity. Selection toward the perfection of this type continued to about the year 1900, when two problems arose to cause a change in the qualifications of a profitable hog.

The Big Type.—The one problem was a problem in production. As the lard-type hog became ever shorter and wider in body and finer in bone, the number of pigs per litter began to decrease, and growth was slow. Breeders had just about decided that they would have to modify their standard and select for greater length of body, even at the expense of width and the yield of lard, in order to get back the characteristic of larger litters when a second problem appeared. This additional problem was a decline in the price of lard because of the introduction of lower priced vegetable oils as substitutes for lard. This robbed the hog of the extreme lard type of his greatest asset and caused a complete reversal of the trend of selection for the next twenty years. Breeders who had been trying to breed hogs as short, wide, and deep in the body and as short and fine in the legs

as they could get them began at once to select hogs for breeding stock that were as long in the body, as long in the leg, and about as narrow and as shallow in the body as they could get them. In their advertising during this period, breeders quite frequently gave the height and length of their herd boars in inches. The greater the length and height of the herd sire the more desirable his offspring were considered to be. One caption in an advertisement carried under the photograph of a well-known herd sire of about the year 1918 read, "The boar so tall it makes him dizzy to look down." This line was expected to attract purchasers of offspring of this boar.

Selection toward this elongated type of hog was accompanied by large litters and heavier milk production in sows, but it also soon produced hogs so coarse, slow-maturing, and difficult to fatten that they were about as undesirable and unprofitable to produce as the small-sized, fine-boned type had been.

The Meat Type.—Since swine breeders of the American Corn Belt had found both the extreme in compactness and the extreme in stretch in the hog type undesirable and since lard was still an unwanted hog product, about 1925 breeders finally began to select toward a medium between the two and have now accepted as the ideal type for the lard hog an appearance or form that can be described as medium in length and width, deep in body, medium in length of leg and refinement of bone, with a smooth shoulder, smooth side, and well-filled ham. It has been found that a hog of this type is an easy feeder, grows rapidly, produces from 7 to 10 pigs per litter, and gets fat enough to produce a desirable carcass at the market weight of 175 to 225 lb.

The Bacon Type.—In most European countries and in Great Britain and Canada, swine breeders have established a hog type differing materially from the American lard hog. This type is called the "bacon" type, because hogs classed as bacon type produce a bacon of higher quality than do hogs of the lard type, in that they carry a higher proportion of lean to fat. Hogs of ideal bacon type are described as long and deep in body, medium and uniform in width of body, medium in length of leg, fine in bone, and smooth in covering throughout. To produce the desired high-quality bacon side, they must be made moderately fat at weights of 180 to 200 lb. when they yield a side of bacon measuring about 1¼ in. thick.

Hogs of the bacon type have never become popular with the Corn Belt farmer because it seems difficult to maintain the type under heavy feeding of corn, the type seems a little slower to fatten, and the American market does not pay a premium for hogs of this type, as do the markets of Canada, Great Britain, and several other countries.

THE PURE BREEDS

As was the case with beef cattle, improvement in hogs to date has been accomplished largely through the formation of pure breeds, followed by the use of sires produced in the pure breeds on the common hog stock of the world. Because of the heterogeneous composition of the germ plasm of swine, it was comparatively easy to develop by selection strains or breeds with certain distinguishing characteristics as to color and minor peculiarities in the shape of the head, the carriage of the ear, and, to some extent, in form.

The Poland China.—The Poland China has long been one of the leading American lard-type breeds of hogs in popular favor and in number of purebreds produced. Originating as a breed in the Miami Valley region of southwest Ohio, the breed spread throughout the Corn Belt region with its settlement. The formative period for the breed was 1800–1850. The foundation stock consisted of a rather wide variety of types that were brought into the area and intermated. The source of some of the hogs forming the foundation stock is not known. In the breed histories they are referred to as the common stock of the country. Intermingled with this common stock in the formation of the Poland-China breed were several strains referred to as the Russian, the Byfield, the Big China, the Berkshire, and the Irish Grazier. These strains or types varied in shape, size at maturity, quality, and color. It is probable that the Berkshire, already established as a breed in Great Britain before it was imported to the United States, had more to do with fixing the type of the Poland China than any of the others. It was from the Berkshire that the Poland China is thought to have derived its characteristic color of the black body with six white points.

Beginning as a rather large hog about the year 1840, selection within the Poland-China breed was directed first toward refine-

ment until about 1910, then toward the "big type," until about 1930, and since 1930 toward the medium or meat type.

Registry Associations.—For most of the lard-type breeds of swine, a number of associations of breeders organized primarily to provide facilities for the registration of hogs and issuing of pedigrees were formed. There have been at different times at least eight such associations of Poland-China breeders. At present Poland Chinas are registered by three associations, the American Poland-China Record Association, Union Stockyards, Chicago, Ill., the National Poland-China Record Association, Winchester, Ind., and the Standard Poland-China Record Association, Marysville, Mo.

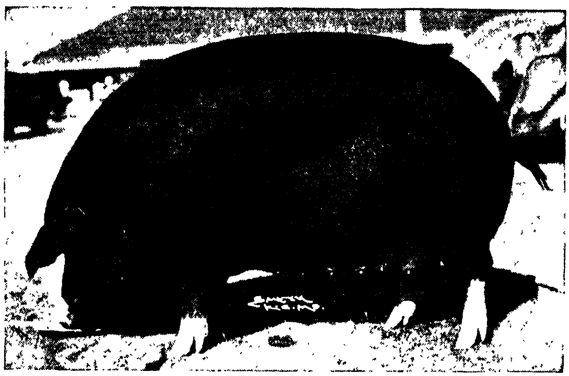

FIG. 40.—The Poland-China sow Perfect Lady. Grand Champion, Illinois State Fair, 1941. (*Photograph by Smith.*)

Poland-China Type.—The typical Poland-China hog of today is described as medium to large in size, medium in length and width of body, deep in body, medium in length of leg, and deep and full in ham. The ears are medium in size, drooping, and medium in quality. The color is black, with six white points, meaning some white in the face, some white on each of the legs, and white hair forming the switch of the tail. A few small white spots on other parts of the body are permissible. The breed is classed as a lard-type breed.

The Spotted Poland China.—The Spotted Poland China is descended from much the same foundation stock as the Poland China. Some hogs not of Poland-China breeding have probably been incorporated with this new breed. For a number of years breeders of Poland Chinas having hogs showing an excessive

amount of white spots were allowed to register them in the Spotted Poland-China record. This privilege was withdrawn some ten to fifteen years ago. At the time the Spotted Poland China was recognized as a new breed, hogs of this breed were claimed to be longer of body, more thickly covered with muscle, and easier to feed than the Poland China. It was claimed that the sows produced more pigs per litter, were heavier milkers, and that the pigs grew faster than Poland-China pigs.

Registry Associations.—Spotted Poland Chinas are registered by the National Spotted Poland-China Record Association, Indianapolis, Ind., and the American Spotted Poland-China Record Association, Moberly, Mo.

FIG. 41.—The Spotted Poland-China sow, Miss Rosewild. Grand Champion, Iowa State Fair, 1940. (*Photograph by Smith.*)

Spotted Poland-China Type.—The present-day approved type for the Spotted Poland China is practically identical with the standard for the Poland China except that the Spotted Poland China must have a more or less even distribution of black and white color in irregular-sized spotted pattern.

The Duroc-Jersey.—This breed of hogs was produced by combining two types of red hogs that existed in New York and New Jersey from 1800 to 1850. The one was known as the "Duroc" and the other as the "Jersey Red." The Jersey Reds are described as large, coarse hogs that attained great weights of 1,000 lb. or more at maturity; the Durocs were smaller and more refined in bone and hair.

The type resulting from the combination of the two rather different foundation stocks began to show some uniformity in

the East about 1870, but it was not until 1882 that the first record association for Duroc-Jerseys was formed by a group of breeders at Elkhorn, Wis.

The Duroc-Jersey breed passed through the same type trends as did the Poland China. Selection was directed toward the extreme in lard type and refinement to about 1910, then toward the "big type" to 1930, and toward the meat type since 1930. At one time during the period about 1900–1915, more purebred Duroc-Jersey hogs were being produced annually than hogs of any other breed. Breeders seemed to follow the trend toward

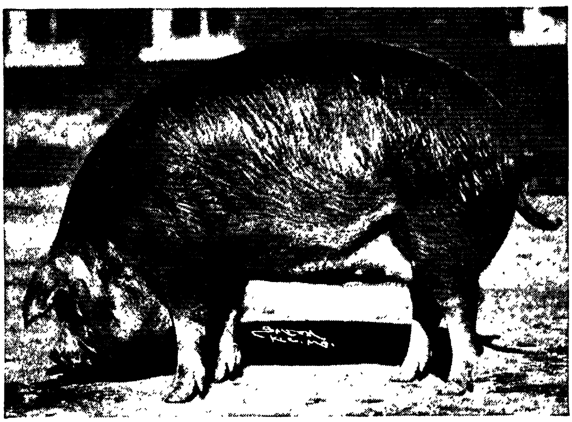

FIG. 42.—Duroc-Jersey sow. Junior Champion, American Royal Livestock Exposition, 1939. (*Photograph by Smith.*)

the big type to a greater extreme than did breeders of the other lard breeds. As a result, when the type trend swung toward the shorter bodied, wider, deeper bodied, shorter legged, fuller hammed meat type, Duroc-Jersey breeders found it difficult to bring about the desired change in type in their herds. This problem caused the breed to lose much of its popularity. It is only during the past few years that any considerable number of Duroc-Jersey breeders have been able to present hogs of the type that is desired in present-day swine production. Many herds are now beginning to present hogs of acceptable type, and there is no faster growing, easier feeding, quicker maturing hog than the modernized Duroc-Jersey.

Registry Associations.—There have been several record associations for Duroc-Jerseys, but the number has been reduced to

one active association, the United Duroc Record Association, Peoria, Ill.

Duroc-Jersey Type.—The present-day standard type calls for a hog that is medium in length and width of body, deep in body, smooth in shoulder, deep and full in ham, and medium in length of leg. The head is medium in length, the ears drooping. A bright, cherry-red color is preferred, but this may vary to a light red, reddish yellow, or a dark red, almost black in older hogs.

The Chester White.—The Chester White originated as a breed in southeastern Pennsylvania during the period about 1820–1860.

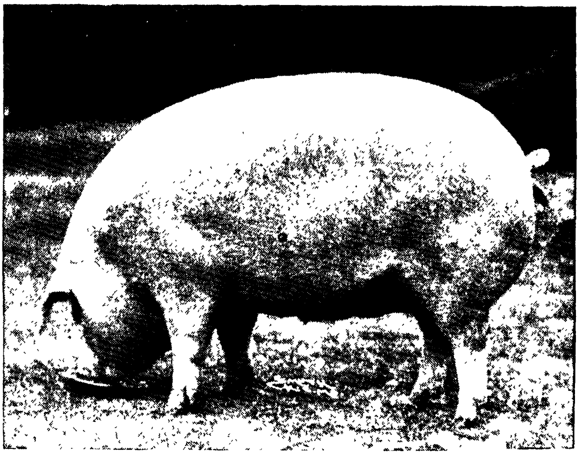

FIG. 43.—The Chester White sow Lisle Lilly. Grand Champion, Illinois, Indiana, and Ohio State Fairs, 1941. (*Photograph by Smith.*)

It was the result of combining several types of hogs existing in the locality at that time. Several of the types were white in color, but some hogs of black color are thought to have entered into the foundation stock. The several types ranged from large, coarse hogs to fine-boned, small hogs. The name "Chester White" was taken from Chester County, Pennsylvania, one of the counties in which the breed was first recognized. Some progress in improvement and in the establishment of a uniform type was made in eastern Pennsylvania, and this breed was further improved by the introduction of additional blood from hog types encountered in Ohio after foundation stock had moved westward to the corn-growing area in Ohio. Thus it is seen that a wider variety of foundation stock entered into the formation of this breed than any other American lard-type breed of hogs.

The breed failed to develop as rapidly in public favor as the Poland China or Duroc-Jersey, partly because of the fact that white hogs sunscald so easily and partly because of the lack of uniformity that persisted in the breed for many years. The breed did receive wide distribution throughout the Corn Belt, however, and gained a great deal in popular favor from 1920 to 1930. This was due to the fact that most Chester White breeders had not selected for the extreme in big type as did Poland and Duroc breeders. When the big type became unpopular many farmers changed from the use of Poland and Duroc boars to Chester, because the Chester had retained greater width and depth of body, easier feeding quality, and matured earlier.

Registry Associations.—There have been at different times at least seven associations organized to register Chester White swine. All have discontinued except the Chester White Record Association, Rochester, Ind., and the Breeders' Chester White Record Association, Des Moines, Iowa.

Chester White Type.—Chester Whites have passed through the same type trends as other lard breeds, except that in very few herds was selection carried to the extreme, as with Polands and Durocs. The present type standard is a hog of medium length and width of body, deep in body, smooth of shoulder, deep and full in ham, and medium in length of leg. The head is medium in length, the ear medium in size and drooping. The color is white, any black hair being a disqualification for registration, but occasional small black spots on the skin are permissible.

The Hampshire.—There is little authentic information about the origin of the Hampshire. Hogs with the characteristic color of black with a white belt are known to have existed in Pennsylvania, Massachusetts, New York, Connecticut, New Jersey, and Kentucky during the period 1800–1850. It is thought that some hogs that entered into the foundation stock of the Hampshire were imported from Hampshire County, England. It was probably from this infusion of blood that the Hampshire was given its name. Throughout its history, the Hampshire had been a somewhat smaller, earlier maturing, finer boned hog than had the other lard breeds. The breed did not become popular in the Corn Belt until after the year 1910. It has, however, spread to all parts of the country and increased rapidly in numbers of pure breds produced during recent years.

Registry Association.—Hampshires are registered by the American Hampshire Swine Record Association. The office of the secretary is in Peoria, Ill.

Hampshire Type.—Since its rather recent recognition as a pure breed in 1893, the Hampshire has experienced less change in its type standard than any other American-produced lard breed. The merits on which it began to gain popular favor with farmers were the smooth, compact form, the easy feeding, early maturing characteristics, and the high favor in which hogs of this breed were held by processing companies and retail-meat

FIG. 44.—The Hampshire sow, Smooth Queen. Grand Champion, Iowa State Fair, 1939. (*Photograph by Smith.*)

dealers. Hampshire sows were found to be good mothers, producing large, even litters of from 8 to 10 pigs, the pigs possessing strong vitality and the sows milking well. During the period of popularity of the big type, some Hampshire breeders did succeed in producing Hampshires that were rather long, shallow-bodied, and long-legged, but many breeders did not follow this lead. As a result, when the demand for the medium meat-type hog developed, Hampshire breeders were quite well equipped to meet it, with the result that Hampshire barrows have been frequent winners in market-type and carcass contests during the last twenty years. The present-day Hampshire-type standard calls for a hog that is medium in length and width of body, deep in body, compact and smooth in form, deep and full in ham, medium in length of leg, and fine but straight and

strong in legs. The head of the Hampshire is medium in length, the ears rather pointed and carried erect. The color is black, with a white belt extending over the shoulders and covering the front legs. A little white on the rear pasterns is permissible. The white belt may vary in width but must be complete. Many Hampshire pigs are disqualified from registration as pure breds because of imperfect coloring, either an incomplete belt or too much white color.

The Berkshire.—Although in America the Berkshire has always been considered a lard-type breed, it is not an American

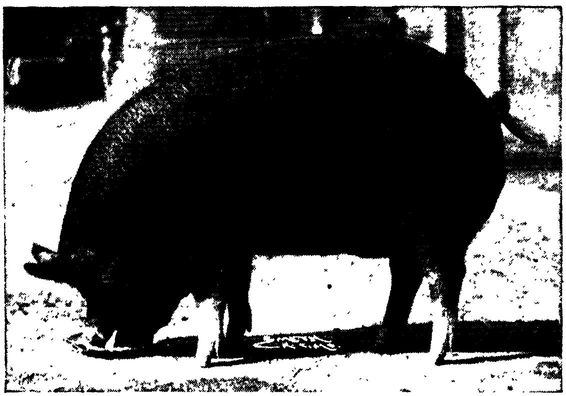

Fig. 45.—Berkshire sow, first prize senior gilt, American Royal Livestock Exposition, 1941. (*Photograph by Smith.*)

production. It is the only imported breed to gain recognition in the Corn Belt as a lard-type breed. Originating in England, the Berkshire received its name from Berkshire County, England. The first purebred Berkshires were brought to the United States during the same period that marks the formative period for the American lard breeds, 1800–1850. Although Berkshire blood is thought to have entered into the foundation stock of several of the American breeds, the Berkshire as a breed escaped intermingling of other types. In England several types did enter into the foundation stock, some large and some small, just as was the case in the formation of the American breeds. When first introduced to America, the Berkshire had many of the characteristics that are still found in the present-day type. The Berkshire has always been a meat-type hog known for its high

percentage of muscle to fat. This quality has helped to bring increased popularity to the breed during recent years. This breed, like the Hampshire, was well equipped to meet the requirements of the modern meat-type hog. Since they cross well with the American lard breeds, Berkshire boars are at present in broad demand for mating to sows of the American breeds for the production of market hogs.

Registry Association.—Berkshires are registered by the American Berkshire Association, Springfield, Ill.

Berkshire Type.—Early Berkshire hogs were medium in size, medium in length of body, wide and deep in body, thickly covered with flesh, full in ham, and short in legs. They possessed a short, dished face and short, pointed ear carried erect. The color was black with six white points. The only change that has taken place in this type standard has been selection toward a slightly more upstanding hog, with a little less width of body and less dish of face. Quality of bone, hair, and ear, and thickness and smoothness of flesh covering are emphasized as the valuable characteristics of the breed.

The Yorkshire.—The Yorkshire, another breed of English origin, takes its name from Yorkshire County. It is one of the two breeds of bacon type that have been imported to the United States. Because the bacon type of hog has never met with popular favor among American swine producers, the Yorkshire has never gained much prestige in this country. It is, however, the leading breed of hogs in England and Canada and throughout the British Empire. Yorkshires have been exported from Great Britain to many foreign countries and have entered into the breeding stock in many countries where hogs of bacon type are in favor.

The foundation stock for this breed is described as a large, long, narrow-bodied, long-legged, coarse-boned type with white color predominating. Improvement has been wrought principally by selection, with possibly the introduction of some blood from more refined, thicker fleshed, stronger backed hogs from other parts of England. Yorkshires in appreciable numbers were first brought to the United States during the decade 1890–1900.

Registry Association.—Yorkshires in Great Britain are recorded in the National Pig Breeders' Association. The American Yorkshire Club, organized in 1893, has always been the one

record association for this breed in America. The office of the secretary is at 1001 Lafond Street, St. Paul, Minn.

Yorkshire Type.—The Yorkshire has always been a long-bodied, narrow, long-legged type of hog. In improving it, breeders have simply selected for a little more width, more depth of body, a fuller ham, a stronger back, and greater refinement of bone, hair, and ears and for a smoother covering, so that the present standard is described as a pig of good length of body, medium width, a deep side, strong back, full ham, medium length of leg, showing refinement of bone, head, and ear, and a smooth, even covering of flesh over the entire body surface.

FIG. 46.—The Yorkshire sow, Cedar Brook Molly. Junior Champion, Canadian National Exhibition, 1941. (*Courtesy of Canadian Swine Breeders' Association.*)

The ears are medium in length and are carried moderately erect. The color is white; black hair bars from registration, but small black spots on the skin are permissible.

The Tamworth.—The Tamworth is the second of the British breeds of bacon type to be imported to the United States. Like the Yorkshire, it is considered to be a direct descendant of the oldest hog stock of Breat Britain. The two bacon breeds are the most likely direct descendants of the wild hog of Europe of all the present-day hog stock of the United States. Although the Tamworth has persisted as a breed in Great Britain, it has never been produced in large numbers even in that country. The first Tamworths were brought to the United States from Eng-

land during the period 1880–1890. The original Tamworth stock in England is described as a hog of sandy red color, hardy, and prolific but rather poor in form and slow to mature. Improvement has been made wholly by selection toward perfection of the ideal bacon type. The Tamworth has always been known as a hog of extremely restless disposition, which probably accounts for its hard feeding, slow maturing characteristic, with consequent lack of favor with swine producers. The production of an unusually high-quality bacon carcass by the better specimens of the breed accounts for the interest that has kept the breed in existence, even though in very small numbers.

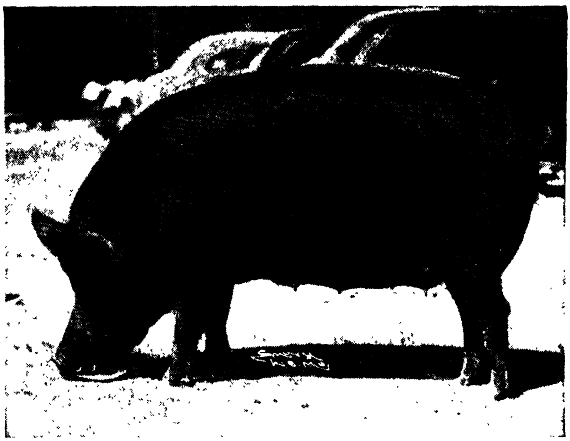

Fig. 47.—The Tamworth sow, G. V. Princess 45th. Grand Champion, Illinois State Fair, 1941. (*Photograph by Smith.*)

Registry Association.—Tamworths, like the Yorkshires, are registered in Great Britain by the National Pig Breeders' Association. In the United States, Tamworths have always been recorded by the American Tamworth Swine Record Association, which was organized in 1897. The office of the secretary is in Ames, Iowa.

Tamworth Type.—The present-day approved Tamworth type is described as a hog of medium length and width of body, deep in sides, full in ham, medium in length of leg, fine in bone and ear, smooth in body covering, conforming generally to the requirements of the best bacon type. The head of the Tamworth is inclined to be long and pointed at the snout, the ears medium

in length, pointed, and carried erect. The color is a sandy red, often turning to light yellow or dark red with advancing age. Occasional small black spots of hair are permissible.

SWINE-BREEDING METHODS

From the foregoing discussion of swine types and the development of the pure breeds of hogs, it may be deducted that, as a whole, the swine stock of the United States contains a wide variety of characteristics secured from many sources. Authentic history of swine breeding goes back through only about the last 100 years. During this period, swine breeding for improvement involved principally combining already more or less established types followed by selection toward new uniform breeds that would combine the desirable and eliminate the undesirable characteristics of the foundation strains. In the production of some of the breeds, some mating of related animals was practiced. This probably exerted a beneficial influence in aiding to eliminate undesirable characters more rapidly. Once a new breed showing desirable characteristics uniformly from generation to generation became established, sires of this breed were purchased in large numbers by farmers and mated to the common sow stock.

Grading Up.—Grading up in swine breeding means starting with a group of common sows and using purebred boars of the same breed as herd sires from that point on. By this breeding plan the herd will in a few generations show the characteristics of the breed from which the sires were selected. Grading up has been the method by which most of the improvement in the vast bulk of hogs produced in America has been secured during the last fifty years.

Crossbreeding.—Mating a boar of one breed to sows of another breed for the production of market hogs has long been a rather common practice. For many years it was thought that this plan of breeding resulted in increased vitality, more rapid growth, and more efficient utilization of feed by the crossbred pigs than would be secured from high-grade or purebred pigs. It was also thought that crossbred sows would not prove satisfactory as brood sows because the pigs would lose their uniformity and vitality in the second generation.

It remained for the extensive experiments in the crossbreeding of hogs carried on by Winters and others at the Minnesota Experiment Station[1] to prove conclusively that the crossing of breeds does result in increased vitality, more rapid growth, and more efficient use of feed. It was also demonstrated that the crossbred sow does make a highly satisfactory brood sow if she is mated to a purebred boar of either of the parent breeds or a purebred boar of a third breed. The vitality of the first cross shows in a tendency on the part of the crossbred sow to produce large litters of strong pigs and to nurse them well.

In raising crossbred hogs for market production, after the first cross has been made the crossbred sow may be retained as a brood sow and matings made from that point on alternately to boars of the parent breeds, or a third breed may be introduced and sires of the three breeds rotated. There has been a marked increase in the practice of crossbreeding hogs for market production during the past ten years.

Breeding Purebreds.—The breeding of purebred swine has two advantages: (1) The breeder who is successful in producing purebreds of high merit may market a high percentage of pigs produced for breeding stock at prices considerably above their value for meat. (2) Because hogs reproduce rapidly, any farmer may begin by the purchase of one purebred sow and in a few years have a herd of purebred sows that will have cost him very little extra money compared to the cost of developing a herd of grade or crossbred sows. The uniform type and color of the purebreds is a desirable characteristic in market-stock production, because a group of good hogs of uniform color always has at least a slight advantage in appearance over a similar group of mixed colors.

Questions

1. What is considered to be the origin of the domestic hog?

2. What are the two standard present-day types of hogs?

3. What circumstances led to the development of the so-called "big type" of lard hog?

4. What are the principal differences between the modern approved lard-type or meat-type and the bacon-type hog?

5. Name the important pure breeds of hogs in the United States, of American origin; of British origin.

[1] *Univ. Minn. Agr. Expt. Sta. Ext. Bul.* 180, 1936.

6. What are the outstanding breed characteristics of each of the preceding breeds of hogs?

7. How has improvement in the common hog stock of the United States been secured?

8. What are the advantages of crossing the breeds in market-hog production?

9. Explain how crossbreeding should be carried on to secure its advantages to the greatest degree.

10. What advantages might there be in breeding purebred hogs over grading up and crossbreeding?

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CHAPTER XXI

SWINE FEEDING

Feed cost represents about 75 per cent of the total cost of producing hogs. Efficient feeding is, therefore, one of the most important features of swine management. Hogs are efficient users of feed but require concentrate feeds and must be fed largely on grains, corn, and by-products from the processing of the grains for human consumption rather than grass, hay, and straw.

The Nutritive Requirements of Hogs.—Because feed is the most important cost item in raising hogs, a great deal of research study has been given to the nutrient requirements and to methods of feeding. As a result, marked improvement in efficiency of swine-feeding methods has been made during the last fifty years, and many new practices have been introduced. In the earlier days of swine production, hogs were fed almost entirely on carbonaceous feeds. They developed normally but slowly and consumed large amounts of feed per 100 lb. of gain. Not so many years ago, a daily gain of 0.75 to 1 lb. per pig per day was considered a satisfactory rate of gain, and it required 700 to 800 lb. of feed to produce 100 lb. of gain. Today 1.25 to 1.50 lb. of gain per pig per day is considered normal, and 350 to 450 lb. of feed produces 100 lb. of gain on healthy pigs. This improvement in feed utilization by pigs is due partly to improvement through breeding, but more to the knowledge that has been gained by research and practical experimental studies of the nutrition needs of the pig, with subsequent application of such findings in swine-feeding practice. Carbohydrates and fats must still form the base or bulk of the swine-feeding ration, but efficient feeding of hogs requires proper supplementing of the carbonaceous feeds with protein, minerals, and vitamins.

The Basal Ration or Carbohydrate Requirement.—The hog differs from other farm animals in that it requires much the same kinds of feeds from the time the pigs are weaned throughout the remainder of the life span. The ration for pigs of all ages must

begin with feeds high in digestible carbohydrates. Amounts of feed required per day and the percentage of fiber permissible will vary with the age and size of the pig. The need for protein, mineral, and vitamin supplements will also differ with age. Corn or the cereal grains generally form the base or bulk of swine rations. Wherever corn can be grown to maturity and still yield more pounds of feed per acre than the small grains, it is the choice of the farmer as the base of his swine-feeding ration. Because of its high carbohydrate, high protein, and low fiber content, wheat is first choice of the cereal grains as a hog feed. Since wheat is also the leading bread grain for direct human consumption, it usually sells higher per pound than corn, so that it is seldom used in swine feeding. Wheat middlings, low-grade flour, and bran, by-products from the processing of flour from wheat, are all used extensively as a part of the base ration in localities where they are available at moderate cost. Barley is the grain commonly used as the base for the swine ration in areas growing only small grains. It serves almost as successfully as corn or wheat, but the hull gives it a higher fiber content and reduces its value pound for pound from 10 to 20 per cent below that of corn or wheat. Oats is commonly used to form part of the basal or carbohydrate part of the ration, but its high fiber content makes oats unsatisfactory to use for more than about 25 per cent of the ration. Hull-less oats or mechanically hulled oats make an excellent feed for young growing pigs but are too high in cost to permit of their extensive use. Rye is used in swine feeding but should not be fed to exceed about one-third of the basal ration, since there is something about it, not yet explained, that leads to digestive disturbances if pigs are fed heavily on rye for a continuous period of three months or more.

The Protein Requirement.—In swine-feeding practice, the protein content of the ration is more important than the carbohydrate because the readily available feeds of high carbohydrate content that always form the basal ration for swine are low in protein content and are especially lacking in quality of protein or variety of amino acids. Several of the necessary amino acids may be absent or present in such small quantity that they do not supply enough of those specific amino acids. It is, therefore, necessary to provide some high-protein-content supplemental

feed to the grain ration for hogs of all ages. The feed most commonly used as a protein supplement in swine feeding is skim milk or buttermilk. In recent years the dry-milk products have been used to some extent in place of raw skim milk or buttermilk. Some years ago, it was discovered that a valuable hog feed could be made from the inedible meats, blood, and bones of animals. As processing plants developed equipment for salvaging such waste products, there began to appear on the market several packing-house products recommended and sold as high-protein-content supplemental feeds for hogs. These include tankage, meat meal, blood meal, and bone meal. The tankage has been most extensively used. In the beginning tankage was made by placing inedible parts, condemned parts, and entire carcasses of condemned animals into a large vat and cooking the material thoroughly by turning live steam directly into the vat. More recently some meat-processing plants are preparing tankage by placing the material in a steam-jacketed vat so that the steam is turned not directly into the material in the vat but into the space surrounding the vat. Tankage made by the first process is called "steam-rendered" or "wet-rendered" tankage; that made by the second process is called "dry-rendered." In each case, after the material has been thoroughly cooked, the liquid is drained off, the material dried, pressed, and ground into a fine powder. Both wet- and dry-rendered tankage contain about 60 per cent protein. In feeding experiments, the dry-rendered tankage has usually been found to be more palatable and a trifle higher in feeding value. Fish meal, a product made from the heads and waste parts of fish at fish-processing plants and in many instances from entire fish of low quality or nonedible varieties, is now used extensively as a protein supplement in swine feeding.

For many years it was thought that a swine ration composed of the cereal grains or corn and a protein supplement of animal origin, such as tankage, fish meal, or a milk product, constituted a complete ration. More recently it has been learned that a part of the total amount of supplemental protein required may come from a vegetable source such as linseed meal, cottonseed meal, soybean-oil meal, or corn-gluten meal without lowering the efficiency of the ration and that often the cost of the protein supplement may be lowered by substituting one or a mixture of

several of the vegetable-protein supplements for one-half of the amount of protein of animal origin otherwise required.

The amount of protein supplement varies with the age of the pigs. While still nursing, small pigs secure all the protein they need from the milk of the sow, but as soon as they are weaned they need a ration rather high in protein, and mixtures of 85 per cent grains or corn and 15 per cent protein supplement are about the most desirable. After the pigs reach 60 to 75 lb. in weight, 90 per cent grain and 10 per cent protein supplement will suffice; for brood sows, 95 per cent grain and 5 per cent protein supplement will supply the needs.

The Mineral Requirement.—Recent studies of the nutritional requirement of all kinds of farm animals have revealed that a number of mineral elements are needed in the complete nutrition of all animals. This fact has been accepted for many years, but until recently it was believed that animals secured all the mineral matter they needed from the feeds ordinarily supplied. Recent researches have revealed that this is not the case and that hogs generally need to be fed a mineral supplement. The breeding of faster growing, earlier maturing types of hogs and the more rapid gain promoted by feeding protein supplements are responsible for the need of more mineral elements to maintain a balanced nutrition in swine rations. As a consequence, most hog rations are found to be lacking in one or more mineral elements and need a mineral supplement if best results are to be secured.

The hog, like all other animals, needs common salt, and every hog ration should contain a little salt. After the salt need has been supplied, the hog ration is often deficient in calcium and phosphorus, sometimes deficient in iodine, and occasionally deficient in iron, especially for young pigs. It has been found that phosphorus can best be supplied by adding bone meal, calcium by adding bone meal or limestone, iodine by adding potassium iodide, and iron by adding iron sulphate to the ration. Many swine feeders now provide a mineral supplement to their hogs by making a mixture of one-third common salt, one-third bone meal, one-third limestone, and about ½ oz. of potassium iodide to 100 lb. of the mixture. It is thought that if this mineral mixture is kept before hogs, where they can eat what they care to of it, they will eat enough to keep their need of mineral

elements fully supplied. In order to make sure that their hogs are receiving enough mineral supplement, many feeders add 1 lb. of the mineral mixture to each 100 lb. of the grain ration.

Generally an iron supplement is needed only by young pigs that do not have access to fresh earth, and when it is fed, it is given by dosing each pig, putting it in the milk, or by saturating some clean earth with an iron sulphate solution and placing it where the small pigs may root in it and thus get a little into their digestive systems.

The Vitamin Requirement.—Efficient swine feeding requires attention to the vitamin requirements of hogs, insofar as they are known, and the supplementing of swine rations with vitamin supplements when needed. It has been determined that the two vitamins most needed especially by growing pigs are vitamin A, the growth-promoting vitamin, and vitamin D, needed for proper functioning of the mineral metabolism of hogs. Both vitamins are found in green grass and in alfalfa hay. Cod-liver oil and certain other fish oils are particularly rich sources of both vitamins. One way of ensuring sufficient vitamins A and D is by feeding alfalfa hay in small amounts. It is usually fed by mixing finely ground alfalfa hay with the protein supplement, the alfalfa comprising about one-fourth of the protein supplement by weight. When it is evident that the shortage of vitamin A and D in the ration is acute, cod-liver oil or a similar product high in these vitamins is fed for a time by putting a small amount of the vitamin supplement in milk or a slop. One teaspoonful of cod-liver oil per pig per day is the amount commonly recommended. Feeding of the cod-liver oil should be continued for a 3- to 6-week period.

Swine-feeding Methods.—The feeds used and the methods of supplying feeds to hogs vary widely according to the availability and cost of suitable feeds and, within certain limitations, the opinion of the feeder as to what constitutes the best ration and the best method of preparation of the feeds. A few general practices that have been found to be essential to good results may be cited.

The Use of Pasture.—Although hogs may be and often are maintained and pigs raised entirely in a small enclosure, there are several advantages of having them out in the open and on a good green pasture throughout that part of the year when pasture

can be made available. No type of green feed can successfully form a very large part of the ration for pigs, but all hogs benefit from grazing in that it gets them out in the sun, where they synthesize vitamin D. The pasture field provides room to exercise and an incentive to take exercise, which promotes physiological activity and helps to develop strength of legs, pasterns, and feet. Hogs on pasture eat enough green material to replace satisfactorily from one-tenth of the grain ration for growing pigs to one-half of the grain ration for mature brood sows. They secure protein and vitamins from the green feed and in some instances benefit from bugs, worms, and mineral matter secured through rooting in the soil. Almost any tender growing plant makes a suitable pasture plant for hogs, though alfalfa would be first choice of most swine raisers, with rape second. Care must be taken not to graze white pigs in any form of tall growth, since they sunscald badly from the combined effect of sunburn and irritation of the skin from walking through the tall pasture growth.

The feeding of alfalfa hay, a protein supplement of animal origin, and a mineral mixture is required to take the place of pasture through the winter months or at times when hogs are confined in dry lot in summer.

Preparation of Feeds for Hogs.—Many hog raisers like to grind the grains, mix the feeds, and make them into a slop before feeding. Some believe that it pays to allow whole or ground grains to stand in water and ferment for several hours before feeding. It has, however, been demonstrated in many feeding trials that extensive preparation of feeds is not necessary to good swine-feeding practice and that net profits are generally not increased by such treatments as fine grinding, soaking, or cooking of feeds. Corn of the dent varieties generally can be fed whole with larger net profit than if it is ground. The flint varieties and some hybrids may become so hard when thoroughly dry that hogs will not eat them readily. Such corn should be ground coarsely. Most varieties of wheat feed satisfactorily as whole wheat, but some will be sufficiently hard that grinding will pay. Because it is a very hard grain, rye should be ground coarsely, and because of the fibrous cover, barley and oats should be ground coarsely to improve their palatability.

Where hand feeding is followed and less than all the feed the hogs would eat is being given, it is necessary that the protein

supplement be mixed with the base ration. The mixture may then as satisfactorily be fed dry as be made into a slop or soaked. Skim milk and buttermilk may be fed clear in troughs. Water should be before pigs at all times in some sort of automatic watering device.

The Self-feeder.—A method of feeding hogs that has come into very general use during the last twenty-five years is the free-choice, self-feeder plan of feeding. In carrying out the free-choice, self-feeder plan, the common practice is to place one or two carbohydrate feeds such as corn and ground oats in separate compartments of a self-feeder, a protein supplement or protein-supplement mixture in a third compartment, and a mineral mixture in a fourth compartment. Many pigs are fed by this plan from the time they are weaned until they are sent to market. Many swine raisers use the self-feeder for brood sows, using a mixture of feeds that contains a high percentage of bran, oats, or ground alfalfa hay so that they will not become overly fat from such a liberal ration. Where fattening hogs are pasturing a cornfield or receiving ear corn, a self-feeder with oats or middlings, a protein supplement, and a mineral mixture should be kept conveniently near the hogs.

Feed Requirement and Rate of Gain.—Since feed represents so large a part of the cost of raising hogs and finished hogs of market weights sell within so narrow a price range, the swine raiser is always keenly interested in feed requirement and feed costs.

The amount of feed eaten by a pig daily increases rapidly as the pig grows larger, but the amount consumed per 100-lb. live weight decreases. A pig weighing from 50 to 100 lb. can eat from 3 to 5 lb. of dry feed daily. A pig weighing from 200 to 250 lb. can eat from 6 to 8 lb. daily. The rate of gain for the 50- to 100-lb. pig will be around 1 lb. daily, and the rate of gain for the 200- to 250-lb. pig should be from 1.5 to 1.75 lb. daily. Beyond this weight the rate of gain is likely to decrease, and the amount of feed required to produce 1 lb. of gain is likely to increase.

Questions

1. State several general characteristics of the feed requirement of hogs.
2. What should be the daily rate of gain of a healthy, growing, fattening pig? The feed requirement per 100 lb. gain?

3. What is the importance of carbohydrate compounds in swine feeding? Give examples of suitable carbohydrate feeds.

4. Explain the importance of protein supplements in swine feeding. Give examples of suitable protein feeds.

5. What mineral elements are needed by hogs? How can they best be supplied?

6. What vitamins are most likely to be deficient in swine rations? How may they be supplied?

7. Of what importance is pasture in swine raising?

8. What preparation may be given to advantage to feeds for hogs?

9. What are the advantages of the free-choice self-feeder plan of feeding hogs?

10. How are rate of gain and feed requirement per 100-lb. gain affected by age in the growing fattening pig?

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CHAPTER XXII

THE MANAGEMENT AND CARE OF SWINE

Regardless of the purpose for which hogs will be sold, they are generally raised from birth to the selling age on the same farm. This means that to a very large degree much the same management plan is used wherever hogs are raised.

Management Plans.—The great majority of all hogs are raised to be sold for slaughter as soon as they reach suitable market weights of 200 to 300 lb. For want of a better term, this general plan of management may be designated "raising market hogs." It involves providing the necessary breeding stock, mating the sows, maintaining them through the gestation, farrowing, and nursing periods, and growing and fattening the pigs to suitable market weights. Second in importance to raising market hogs as a swine-management plan is the raising of purebred hogs to be sold for use as breeding stock. The management of purebred hogs differs principally from the raising of market hogs in the way the pigs are grown following weaning and in the way they are sold. As in any purebred livestock enterprise, the objective is to secure a larger profit per pig raised than is possible in market-hog production. In occasional years, because of failure of the feed crops in a locality, it may prove more profitable to market pigs at weaning time or at weights of 75 to 125 lb. as feeders than to buy high-priced feeds to fatten them. There is always a demand for such feeder pigs from persons who have available a supply of low-cost feed but are not equipped to raise pigs. Fattening purchased feeder pigs is a swine-management plan followed by a few persons. The several swine-management plans commonly followed may be listed as (1) raising market hogs, (2) raising purebreds, (3) producing feeder pigs, and (4) fattening purchased feeder pigs.

Raising Market Hogs.—The procedure followed and the equipment needed in raising market hogs will vary some on different farms. It is influenced more by climatic conditions than by

any other factor. In the Southern states and even in the southern half of the Corn Belt area, pigs may be farrowed at any season of the year and raised successfully with very little equipment except provision for shade, feeding equipment, and fencing. In the Northern one-third to one-half of the United States, housing is essential. The equipment needed and the amount of care required, particularly in the Northern half of the country, vary with the season of the year during which the pigs are farrowed. The periods during which pigs are commonly farrowed may be divided into three general recognized farrowing seasons: (1) February and March, commonly designated "early spring farrowing," (2) April and May, designated "late spring farrowing," and (3) August and September, called "fall farrowing." Since most pigs reach a desirable market weight and condition of flesh at six to nine months old, it is desirable that farrowing be spread over most of the year so that there will be a fairly steady flow of hogs to market throughout the year. Because a large part of the hog carcass is cured and can be stored for several months, it is not so important that the marketing of hogs be evenly distributed as is the case with cattle, lambs, and calves, where the meat must be consumed within a period of a few weeks following slaughter. The farrowing of pigs may therefore be governed partly by the farrowing season most favorable to successful and low-cost production.

Early Spring Farrowing.—The months of February and March are chosen by the largest number of swine raisers, especially throughout the Corn Belt, as the preferred farrowing season. Pigs require close attention and care during the farrowing season. During February and March labor is available for this work, because these months are ahead of the beginning of the crop-growing season. By farrowing in February and March, the heavy requirement for labor by the pigs is out of the way before the beginning of the crop season. Pigs farrowed in February and March are old enough and large enough to make the best use of pasture through their growing period and will go to market from the pastures, thus leaving the farrowing equipment available for handling fall-farrowed pigs. The early-spring-farrowed pig usually has a price advantage over the late-spring-farrowed pig at market time, because he arrives at the market toward the close of the summer period, which is

always the period of lightest hog marketings of the year. Early spring farrowing is necessary if fall litters are to be raised from the same sows; otherwise the fall pigs will arrive too late in the fall and will be handicapped by cold weather during the first weeks of their lives.

Early spring farrowing is handicapped by the fact that warm housing is essential to success and the early-spring-farrowed

FIG. 48.—The farrowing barn at the University of Minnesota. Well lighted, well ventilated, heated for early spring farrowing.

pig must be raised practically to finished market weight on feed carried over from the previous year's crop. These two items tend to increase production cost. Whenever equipment is provided for the farrowing of early spring pigs, it is advisable that fall pigs be raised on the same farm so that maximum use may be made of the equipment.

LATE SPRING FARROWING.—On farms not equipped with suitable housing for early spring pigs, late April and May farrowing is necessary to success in raising pigs. Many market-hog producers prefer this farrowing season, because it eliminates the larger capital investment in buildings and reduces the amount of attention required following farrowing. Because of the warm weather, pigs farrowed at this season can do a much better job of taking care of themselves at the early age than pigs farrowed earlier, when the weather is colder. The late spring pig can be carried on a small amount of feed until feed from the current

year's crops is available. He is especially suited to fattening by hogging down corn. Because he usually reaches market during the low-price period of the year, he sells at a lower price per pound than either the early-spring or the fall pig. Many market-swine raisers are convinced that this handicap is balanced by lower production cost, due to smaller capital investment, smaller labor requirement, and lower feed cost. Some swine raisers prefer April and May farrowing, because it facilitates carrying out good sanitation control by making possible moving the pigs to a new location each year. If April- and May-

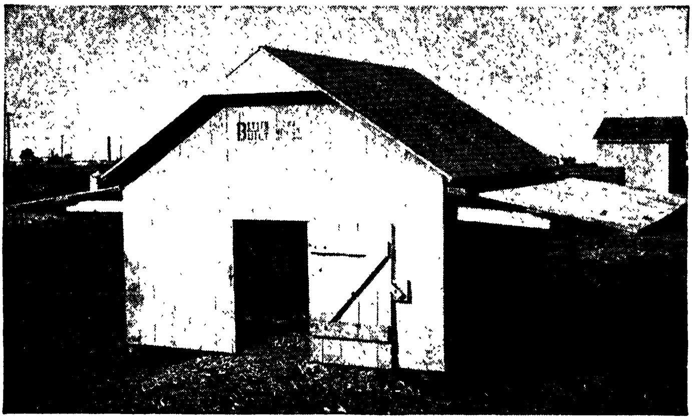

FIG. 49.—A movable field cot suited to late spring farrowing. With sides raised it becomes a good sunshade in summer. By banking the outside with straw it is a satisfactory shelter for winter housing of brood sows.

farrowed pigs are raised, it is the usual practice to sell all brood sows as soon as they can be fattened following weaning of the pigs, then to keep gilts from the current year's crop for next year's brood sows. In following this practice, each brood sow is kept for only one litter of pigs, then marketed. Many swine raisers believe this to be the most efficient method of producing the pig crop. When it is followed, the only pigs carried over winter are the young brood sows. They can be wintered successfully in a modest, inexpensive building.

FALL FARROWING.—Raising some fall pigs is generally advised for farms on which early-spring pigs are raised. Raising some fall pigs makes possible year-round use of the swine-raising equipment, thus spreading the equipment cost over a larger number of pigs. Raising some fall-farrowed pigs makes possible

the keeping of the better brood sows and raising two litters of pigs per year from them. Often a low feed cost and a high selling price at market time give the fall-farrowed pig a profit advantage over the spring pig. Handicaps to fall farrowing are that warm housing through the winter months is necessary and the labor requirement for feeding and care is larger. Contrary to common opinion, it is no more difficult to maintain health of growing pigs in winter than in summer. The pig will gain fully as rapidly and use feed just as efficiently in winter as in summer.[1]

FIG. 50.—Sows and nursing pigs can feed from the same self-feeder if a suitable grain mixture is provided.

Raising Purebred Hogs.—Equipment required, feeds used, and care given purebred hogs differ little from the requirements in raising market hogs until the pigs have passed the weaning age. March farrowing for the spring pigs and September for the fall pigs are preferred farrowing dates. Following weaning, breeders of purebred hogs prefer to grow the pigs under conditions facilitating considerable exercise and prefer the use of feeds well protected with protein, mineral, and vitamin supplements to promote growth and development of strong legs, pasterns, and feet rather than early fattening. Records, needed for registration, sufficiently detailed to permit identification of each pig with the additional information, such as birth date

[1] *Univ. Minn. Agr. Expt. Sta. Bul.* 213, 1932.

and number of pigs in the litter, must be kept. Selling the pigs to advantage is one of the more important responsibilities of the manager of the purebred enterprise. To do this successfully requires first that good pigs be produced. They must then be advertised. Most swine breeders find the exhibiting of hogs at livestock shows to be the most effective and cheapest procedure, at least as a beginning point for the advertising program. Showing may be followed by advertising in swine journals, in general livestock and farm magazines, and in local papers. Before the automobile, many pigs for breeding use were sold by mail order soon after they reached the weaning age, so that they could be shipped to the purchaser by express at low cost. At the present time a large percentage of purebred pig sales are made to buyers living within easy driving distance of the breeder's farm. Buyers wait until nearer the time when they will need the breeding stock, then visit the breeding farm to make selection after the pigs have reached later ages. Holding a public auction is a popular plan of selling boar pigs and gilts during late summer and bred sows during the winter months. To hold a successful auction a minimum of from 35 to 50 head must be offered; otherwise the offering will not attract sufficient purchasers, and the selling expense per head will be too large.

Producing Feeder Pigs.—There are so few circumstances under which the planned production of pigs to be sold as feeders can be considered a desirable enterprise that it deserves little consideration. Occasionally on farms in certain limited regions where there are a large alfalfa acreage and a limited supply of small grains, the alfalfa hay in winter and alfalfa pasture in summer may comprise a considerable part of the feed for brood sows and growing pigs, thus cutting down the feed cost so that the feeder pig of 100- to 125-lb. weight can be produced at very low cost and permit the sale of the pig at a profit. Most feeder pigs find their way to market as a result of some unforeseen emergency arising on farms that generally plan to produce finished market hogs, making it necessary to market the pigs as feeders for the one year only.

Fattening Purchased Feeder Pigs.—There is always a strong demand for feeder pigs. They are wanted for such purposes as fattening on garbage, creamery by-products, following fattening cattle, and as a means of converting corn and cereal

grains into a more readily marketable, higher priced commodity. Expansion of this enterprise is limited only by the supply of feeder pigs that can be secured at prices that will permit a profit. Feeder pigs often sell at prices per pound higher than the price they bring when fat. In other words, hogs are often fattened on a minus margin. This is possible especially when the price of hogs is high, because gains can often be made at from 2 to 4 cents per pound, even though pigs are selling at 10 cents or more per pound. This allows a large profit on the gain in weight to cover the loss on the original weight and still leave a net

Fig. 51.—The automatic watering tank is a much-needed item of equipment for hogs on pasture.

profit on the enterprise. The investment of capital required for equipment for the specialized fattening enterprise is smaller, the labor requirement is low, and turnover on money invested in the feeder pigs is rapid. They are usually fattened in 60 to 90 days. Gains from 1.5 to 2.0 lb. per day are normal for feeder pigs weighing 100 to 125 lb. at the beginning of the fattening period. One important requirement in the specialized-fattening enterprise is maintenance of health and avoidance of death loss. Every known precaution to secure healthy feeder pigs and to maintain health during the fattening period must be taken.

Equipment for Swine Raising.—Two general plans are followed in providing housing for swine. One plan is to provide a central

hog house, used principally as a farrowing house; the other is to provide only small houses built on runners or skids so that they may be easily moved from one location to another. The central hog house is recommended for the Northern half of the United States, when the management plan calls for early-spring and fall farrowing. The central farrowing house is not needed for late-spring farrowing and the raising of one crop of pigs per year, even in the most extreme Northern sections. Many plans for farrowing-house construction are available. These houses are built of all types of material. Provisions for warmth, ventilation, sunshine, and sanitation are the important requirements. Only small exercising yards outside a permanent hog house should be provided, and these should be covered with concrete so that they may be washed and disinfected. A 22-ft. outside width, allowing for two rows of pens 8 ft. deep and a central alleyway about 5 ft. wide, is an ideal width for a permanent farrowing house. Each farrowing pen should be 8 ft. wide, and the length of the building will be governed by the number of farrowing pens desired.

Many types of small movable farrowing houses have been devised. Many are built at lumberyards or factories and sold in "knockdown" form. They can often be purchased in this form to advantage because of the ease with which they may be set up and made ready for use on the farm. The principal precaution in buying or building such a house is to make it substantial enough in construction to stand moving and to give promise of reasonable durability.

To eliminate sunscald, lice, and other skin parasites a dipping vat through which pigs can be driven for treatment should be one of the items of equipment provided on any farm where a considerable number of hogs is maintained. Necessary hog troughs should be of metal, preferably of galvanized iron, so that they can be easily washed and disinfected. Since hogs should have water before them at all times, the cheapest and most satisfactory way of providing it is by the use of some type of automatically controlled watering device, of which there are many on the market. In the Northern one-third to one-half of the country, watering devices should be provided with a kerosene lamp or electric immersion heater to prevent freezing and to take the chill off the water during the winter months. On

nearly every farm on which hogs are raised, much of the feeding can best be done with self-feeders. There are many makes of self-feeders on the market. They can often be purchased ready-made more advantageously than they can be constructed on the farm. Durability should be one of the qualities sought in selecting a self-feeder.

The Work of the Caretaker.—The major part of the work of the swine caretaker is required for the preparation and placing of feed and water before the hogs. This can be reduced to a minimum by careful planning for convenience of feed storage, by the use of automatic waterers, by the use of a cement feeding floor for feeding ear corn, and by the use of self-feeders for all feeding that can be satisfactorily done by the self-feeder method. Some grinding and mixing of feeds will be required when small grains or extremely hard corn are fed. Keeping the hog house and surrounding premises clean and disinfected, keeping fences in repair, constant watchfulness, and immediate action to head off trouble from any source are measures of the ability of the swine caretaker. Prompt attention to the mating of sows during breeding seasons, accurate record keeping of breeding dates, farrowing dates, and marking pigs for identification are important, especially in the purebred enterprise. The final test of the efficiency of the swine caretaker appears at farrowing time, when attention to the sow and litter during about the first three days after farrowing will determine to a large extent the number of pigs raised per litter. The number of pigs raised per litter determines in large measure the amount of profit that will be made from the swine enterprise. Readers are referred to specialized publications on swine raising for detailed information concerning the many features of the care of the sow and litter at farrowing time. Attention to the many precautions that must be taken as a part of the everyday care of hogs to prevent parasite infestations and disease infections from getting a start is a major part of the work of the caretaker. A detailed discussion of this problem will not be undertaken further than the listing of those parasites and diseases known to be most troublesome and devastating to hogs, with simple precautions known to be essential to their prevention.

Swine Diseases and Parasites.—Hog cholera, tuberculosis, Bang's disease, influenza, erysipelas, and "necro" are the more

common infectious diseases of swine. Swine are subject to foot-and-mouth disease, anthrax, and blackleg, but these seldom appear under present-day control measures. Two nutritional diseases, anemia and rickets, are also causes of much trouble in swine raising. The roundworm is the one seriously troublesome internal parasite of pigs, and lice and mange infestations are the troublesome skin parasites. Sunscald, a burning and chapping of the skin due to pasturing tall forage in hot weather, often occurs, especially in white pigs.

Hog Cholera.—Before the introduction, about the year 1910, of the serum and virus treatment of pigs for the prevention of cholera, this was the disease most dreaded by all swine raisers. Cholera has been eliminated from some sections of the country to the extent that regular vaccination of young pigs for its prevention is not necessary. In other localities, where infection is still prevalent, the only safe procedure in preventing possible loss is to vaccinate all pigs when they are from six to ten weeks old.

Tuberculosis.—Because swine-breeding stock is sold at comparatively early ages, tuberculosis is not so serious a menace as in cattle and poultry. Since swine are thought to contract tuberculosis largely from cattle and poultry, the elimination of this disease from cattle and poultry will probably reduce it to insignificance in swine.

Bang's Disease.—Although not so serious a problem in swine as in cattle and horses, Bang's disease seems to be occurring more frequently in swine herds with each succeeding year. Testing of breeding stock for presence of infection and disposing of reacting animals is the recommended control method.

Influenza.—This disease is proving to veterinary science one of the most baffling of all swine diseases. Generally making its appearance each year during the late summer and early fall months, it affects principally pigs between three and nine months old. Symptoms are loss of appetite, a high fever, and coughing. Most pigs affected recover in about ten days but are slow to regain full vitality. A few nearly always develop pneumonia and die. There is no treatment except good care for affected pigs.

Erysipelas.—This is one of the diseases of swine most recently diagnosed. It is known to occur in several different forms with different symptoms. A test for its presence has been developed,

though reliability of the test is not generally accepted. When the disease is suspected, diagnosed, and found present, the prescription of treatment by a veterinarian is recommended.

Necro and Necrotic Enteritis.—The two terms "necro" and "necrotic enteritis" describe two stages of the same infection of the microorganism *Actinomyces necrophorus.* In the disease called "necro" only the lower legs and mouth region are affected by necrotic ulcers. In this stage necro is treated by dipping the affected parts in a strong antiseptic solution. In later stages of the disease, the necrotic ulcers develop on the inner lining of the digestive tract and must be treated by withholding feed and giving intestinal antiseptics. The necrotic infection is easily eliminated from premises by good sanitation and seldom appears where good sanitation is practiced.

Anemia.—Anemia is a nutritional deficiency disease occurring in young pigs only a few days old. It is due to insufficient iron in their systems. It is most likely to occur in early-spring-farrowed pigs that must be maintained indoors on solid floors. Anemia may be prevented by placing a small amount of clean, fresh earth on the floor of the pen, where the small pigs may nose around in it and eat a little of it. It is considered advisable to sprinkle this earth with an iron sulphate solution.

Rickets.—This disease, for many years called "rheumatism" because of its symptoms of lameness, enlarged joints, and pain from muscular movement, has recently been diagnosed as due to insufficient calcium in the food or inefficient metabolism of calcium in bone growth and repair due to calcium phosphorus imbalance or lack of vitamin D. It is most likely to appear in fall-farrowed pigs and brood sows at about farrowing time in the spring. It may be prevented by proper amounts and proper balance of calcium and phosphorus in the ration and by ensuring sufficient vitamin D by getting pigs out in the sunshine as much as possible during the winter months. A further precaution that should be taken is to provide fall pigs and brood sows with alfalfa hay that has been cured in the sunlight. A further supply of vitamin D may be necessary. If needed, it can best be supplied by feeding a tablespoonful of cod-liver oil in a slop to brood sows twice a week or a teaspoonful to fall-farrowed pigs.

The Roundworm.—Pigs become infested with the roundworm by picking up eggs from infested premises. This parasite is

most damaging to young pigs under three months old. The most effective way to combat it is by thorough washing of the farrowing quarters with a strong disinfectant solution and washing of the sow with a mild disinfectant solution just before she is placed in the farrowing quarters. When placed on pasture, all pigs and breeding stock should go on clean ground not used by hogs the previous year. Many hog raisers add to this dosing of the pigs with a worm anthelmintic a few days after weaning.

Lice and Mange.—The presence of lice or mange on pigs is a common aftermath of poor sanitation in their management. Clean quarters and dipping or washing with insecticide solutions will rid hogs of lice. Mange requires repeated treatments with a sulphur or lime-sulphur preparation. A mixture of 6 parts soft oil or melted lard, 1 part turpentine, and enough flowers of sulphur to make a thin paste, applied over affected parts, is a successful remedy for mange.

Sunscald.—The one protection for white pigs against sunscald is to avoid tall, growing pastures and to provide shade. Spraying them with a thin nonirritating oil once a week is advised as a further protective precaution.

Questions

1. What factor more than any other determines the suitability of a farm to the raising of hogs?

2. Why are hogs generally grown from birth to maturity or to market weight on the same farm?

3. Name the two important management plans in swine production.

4. Name the three principal farrowing seasons in market-hog production.

5. State the advantages and disadvantages of each farrowing season.

6. What are the important requirements for financial success in raising purebred hogs?

7. What is the principal source of the feeder-pig supply?

8. Why do feeder pigs at times sell at a higher price than slaughter hogs of similar grade?

9. What are the two rather distinct plans of providing housing for brood sows and litters at farrowing time?

10. What are some of the more important duties of the swine caretaker?

11. Name the troublesome communicable swine diseases; the common nutritional deficiency diseases; the most troublesome swine parasites.

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CHAPTER XXIII

JUDGING SWINE

The judging of hogs is accomplished by much the same procedure as has already been outlined for the judging of beef cattle. The beginning point is the acquiring of a mental picture of the standard or perfect hog. The ideal fat barrow or gilt is used as the standard in the judging of hogs. The description and score for the ideal fat barrow are given on the following page. This score serves equally well for hogs of all the lard breeds or for a market hog of any breeding that is being judged as a lard-type hog ready for slaughter. The diagram in Fig. 52 shows the location of the parts of the animal.

Comparative Judging of Hogs.—Practice in comparative judging of hogs serves the same purpose, has the same values, and is conducted in the same manner as practice in comparative judging of beef cattle. Its principal value is the assistance it gives in building up and perfecting the image of the perfect animal in the mind of the student. Procedure in the judging of hogs differs slightly from procedure in the judging of cattle in that touch is seldom used to aid the eye in hog judging, whereas it is rather extensively used in cattle judging. Since firmness of fat covering is an important factor in determining the desirability of the hog carcass, exacting judges of slaughter hogs do occasionally press the tips of the fingers against the back or side to determine the apparent firmness of the fat. Although this test may be an aid to the eye in verifying an appearance of extreme thickness or thinness of fat covering, it is not a reliable means of determining whether the carcass of the hog will be firm or soft.

Judging Market Hogs.—The statement has been made that the amount of profit the producer will have after his hogs have been sold will depend more on the rate of gain and the efficiency they have shown in utilization of feed than upon the quality of carcass produced, because all hogs sell within a narrow price

Perfect Score for Fat Barrows

Scale of Points	Perfect Score
I. Weight	
6 months, 200 lb. / 9 months, 300 lb.	10
II. Form—55 points	
Head and neck. Snout short, wide, not coarse; face rather short, smooth; eyes wide apart, large, prominent; ears medium size, thin, wide apart; jowl broad, trim, not creased or flabby; neck short, slightly arched, broad on top	6
Forequarters—10 points	
Shoulders. Smooth, well fleshed, even with sides; compact on top	5
Chest. Wide, deep; no depression behind the shoulders	3
Front legs. Straight, medium length; bone medium size; pasterns upright; toes not spreading	2
Body—25 points	
Back. Slightly arched, wide; uniform in width; smooth and deep in covering	7
Loin. Slightly arched, wide; uniform in width; smooth and deep in covering	7
Sides. Low, deep, smooth; not creased or wrinkled; thickly and firmly fleshed; flanks low	7
Belly. Straight, wide; not paunchy, narrow, or flabby	4
Hindquarters—14 points	
Rump. Long, wide; not drooping	4
Hams. Wide, deep, full, not flabby	8
Hind legs. Straight, medium length; bone medium size; pasterns upright; toes not spreading	2
III. Finish. Indicated by a smooth, firm, thick covering over all parts of the body	10
IV. Quality. Smooth in form and finish; not creased, wrinkled, or flabby; bone, head, and ear medium size; hair straight and fine	5
V. Dressing percentage. High finish; not paunchy	10
VI. General appearance. Broad, uniform in width, deep, long, low set; top line slightly arched; underline and sides straight; not paunchy, symmetrical, stylish	10
Total	100

NOTE: The score card was prepared by staff members of the Division of Animal Husbandry University of Minnesota, for use in the teaching of judging.

range, regardless of their market grade. It is true that the price range for hogs arriving at a large market is generally much narrower than the price range for either cattle or sheep, except that a few hogs of extremely undesirable characteristics sell at extremely low prices. The explanation of the narrow price range for different classes and grades is that the dressing percentage of all hogs is high, the lard has about the same value, whether it comes from a hog of good form or poor, and other products vary less in value between the choice grade and the common grade than is the case with cattle and sheep. Nevertheless, there is sufficient difference in value and price to require careful attention to classifying, grading, and pricing hogs on the part of the salesman, if the producer is to be equitably paid according to the merit of his animals.

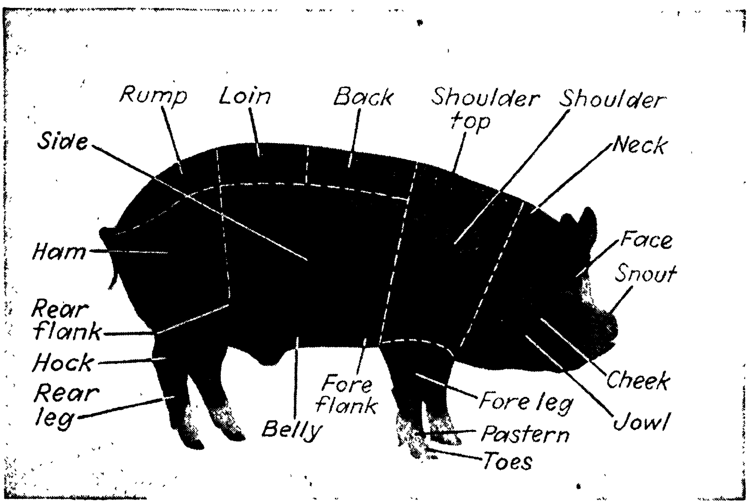

FIG. 52.—Showing location of parts of the hog.

Sale by Dressed Weight and Grade.—There is a growing demand on the part of the producer for closer scrutiny and more accurate classifying and grading on the part of buyers. This demand has gone so far as to suggest that a more equitable method of buying on the part of processors might be to make payment on the basis of the weight and grade of the dressed carcass rather than on the live-weight basis. Such a plan for buying hogs has been followed for a number of years in Denmark and for several years in Canada. Recently the Canadian govern-

ment made a ruling that henceforth all hogs purchased by processors in Canada must be paid for on the basis of dressed weight and grade. The grading is done by graders in the employ of the government.

The hog lends itself to this plan of purchase, because the by-product amounts to little and is uniform, except as it is affected by the size of the hog. In a few instances during the last twenty years, several of the smaller processing companies have experimented with the plan of buying by dressed weight and grade, but as yet none has established this plan completely or permanently in its plant. Whether this method of purchase will become extensive in the United States remains to be seen. If it does, expert judges or graders of carcasses will take the place of expert salesmen and buyer judges of live hogs.

The principal argument advanced in favor of sale by dressed weight and grade is that the grading would be done by a disinterested, salaried, government-supervised employee, and it would be to his advantage to grade all hogs as correctly and accurately as he could. Following such grading, the producer would be paid more equitably than at present. It is not claimed that the total amount of money received by all producers would be larger but only that producers of good hogs would receive higher prices and producers of inferior hogs would be penalized more than they are under the present live basis of sale and payment. The arguments against sale by dressed weight and grade are (1) that this would only add to marketing costs, which, in the end, the producer must pay; (2) that the present method of sale takes care of all the conditions that arise in the marketing of hogs in a manner fully as equitable to producers as the new plan would be; (3) that such a change would necessitate reorganization of many established procedures in marketing practice and methods and on this account is not to be desired.

The foregoing arguments are countered by pointing out that many progressive developments have occurred in many lines of endeavor in the past that have necessitated extensive reorganization in many industries. Persons engaged in those industries have had to adopt the new methods and reorganize to meet them or else go out of business.

Classifying and Grading Live Hogs.—Since no organized move has yet been made to bring about the sale of hogs on the basis

of rail weight and grade, it is probable that market hogs will continue to be purchased on foot for some time to come. The first task in arriving at the price for which a group of market hogs should sell is to get them correctly classified and graded. This requires a thorough knowledge of the requirements of the several classes and grades and then ability on the part of the seller or buyer to sort the hogs into the proper classes and grades. Because hogs are handled in such large numbers this must be done quickly. A good salesman must be able to determine the

FIG. 53.—Chester White barrow. Grand Champion over all breeds, International Livestock Exposition, 1941. Near ideal for medium-lard type or meat-type hog. (*Photograph by Abernathy.*)

class and grade of each individual at a glance. Sex condition, age, and weight are the important characters determining the class, and form, degree of fatness, and quality determine the grade. In practice in grading on the large markets, it often appears that most emphasis is placed on degree of fatness or finish, some emphasis on quality, and less emphasis on form than this qualification might deserve. The expert judge aims to place about equal emphasis on each of the three factors—form, finish, and quality.

Selecting Breeding Animals.—Type in hogs may not be so important in the selection of breeding stock as it is with beef cattle, but it is the starting point in the selection of breeding animals. No breeder can hope to maintain a high standard of excellence in his herd of hogs or improve them if he does not have clearly in mind the correct type for his breed. After careful

and able attention is given to the selection of those hogs that most nearly fulfill the requirements of correct type, breed characters, form, and quality, there are several ways in which selection for breeding use may be supplemented. They include selection based on ancestry, progeny, show-ring winnings, and performance records.

Selection Based on Ancestry.—Because the life period, even for a brood sow or herd boar, is limited to two or three years, it is possible for the breeder in a few years' time to know the merits and weaknesses in the ancestry of his breeding stock for several generations back. The ancestry, therefore, may be used to a large extent as a basis for retaining breeding stock. The breed journals are useful as a source of information concerning ancestry and may be used as a source of information concerning the merits of the ancestry of herd-boar prospects before a purchase is made.

Selection Based on Progeny.—Because of the early age at which hogs reach breeding maturity, the short gestation period, and the large number of pigs produced per litter, it is often possible to base the selection of brood sows and herd boars on the kind of progeny produced. The sow that produces an unusually good litter of pigs as her first litter may be retained and may produce from three to six litters before she will need to be discarded. Likewise, the sow that produces an unusually poor first litter may as well be sent to market, since it is doubtful if it would pay to give her a second trial. Boars that prove to be outstanding sires may be retained until they are four or five years old.

To make use of the character of ancestry and progeny as aids to selection, it is essential that pigs be marked individually for identification and that herd records be kept accurately so that the ancestry as well as the progeny of any sow or boar may be readily traced.

Selection Based on Show-ring Winnings.—Breeders of purebred swine have long been noted for their enthusiastic support of the show ring as a place to test and to publicize their hogs. Selection of breeding stock on the basis of show-ring winnings or on the basis of prize-winning ancestry has taken precedence over all other bases for making selections, and show-ring winnings are emphasized in all advertising of purebred hogs when such win-

nings are available. Perhaps the principal value of show winnings as a supplement to selection is that they help to direct the beginner or the more inexperienced breeder to those strains of hogs that at the moment are meeting with the approval of the better breeders in general type and in breed characteristics. The fact that the type meeting approval in the show ring has varied rather widely during the history of swine breeding for improvement in the United States has made it necessary for the breeder desiring to produce hogs of popular type to follow the large shows rather closely. To some extent the show ring may be blamed for carrying the short, broad, short-legged, fine-boned type standard beyond the limit of most profitable production during the period about 1885–1910. The show ring may again be blamed for carrying the trend toward the big type beyond the point of most profitable production during the period 1910–1930. With the present trend toward a medium meat-type standard, the judges at important swine exhibitions might be cautioned against going to an extreme again by placing at or toward the top of the classes hogs that are too short in body and too short in leg and fine in bone on the grounds that they are the easy feeders.

Selection Based on Performance.—When the characteristics of the ancestry, the show record of the individual, and the merit of progeny are taken into account in selecting breeding stock, it might be maintained that selection is being based on performance. This point of view, however, does not cover the basic factor of the performance record as it is used as an aid in livestock selection. A performance record is rather a record of the amount and quality of product produced by an animal in a given period of time. It may include also a record of feed consumed to produce a given amount of product. For instance, the amount of milk and butterfat produced by a cow in a year, the number of eggs laid by a hen in a year, or the time required by a race horse to run a mile are examples of performance records that have been kept and used as aids in the selection of dairy cattle, poultry, and race horses. As yet feed requirements have not been included in performance records for the preceding types of animals.

Progressive breeders of hogs have recently shown an interest in the development of a performance record that might be used as an aid in the selection of hogs for breeding use. Perhaps the greatest progress in this direction has been made by the swine

breeders of Denmark, where a plan of testing pigs that has worked fairly satisfactorily was initiated some years ago. The Danish performance record requires that four pigs of a litter be sent to a government-supervised feeding station at the time the litter reaches the weaning age of eight weeks. At the feeding station the four pigs are fed a standard ration and cared for according to a standard method of procedure. Three of the pigs are slaughtered when each pig reaches a weight of 190 lb. The grade score for the carcasses and a grade score based on the amount of feed required to produce the gain are put together to arrive at a total score for the performance of the litter. If the litter meets the minimum requirement, one gilt may be returned to the owner to be retained as a brood sow. Sires and dams of litters making a required minimum score are then approved for breeding use, and sires and dams of litters failing to make the required score are not. The Danish swine-performance record has led breeders to select for efficient utilization of feed and the production of a high-scoring carcass, with little emphasis placed on minor breed characteristics or even on such characters as strength of back, strength of feet, pasterns, and legs, and other minor points of form. It is claimed that selection of breeding stock on the basis of performance records is responsible for the plump, smooth, attractive-appearing ham, the high-quality side of bacon, and the efficient utilization of feed characteristic of the Danish Landrace breed of hogs.

The Danish method of keeping performance records has been tried by several experiment stations in the United States but has not yet been put into practice in a general way by breeders. It is being carried on in a small way for breeders in Canada, where the Canadian experimental-farm system is establishing pig-testing stations and developing performance records for Canadian hogs. To date, facilities are available for the testing of only a few litters of pigs each year.

Several other types of performance records for pigs have been proposed, and some are being tried in a small way by American swine-record associations and experiment stations. These include (1) using only the number of live pigs and the average weight of the pigs at weaning time; (2) using the total weight of the litter at 180 days old, as in the ton-litter contests; (3) using a complete record of the number of pigs farrowed, the number raised, the rate of gain, the uniformity of the litter, the feed

required by the litter to produce a pound of gain, and the score of the live pigs when they reach a weight of about 200 lb.

The last mentioned type of performance record would be the most reliable as an aid to selection. If it is ever developed extensively in the United States, a plan must be worked out whereby the pigs are left on the farm of the breeder and the work of gathering the data is supervised by a disinterested supervisor working under the direction of an official of a registry association or of the state or Federal government. Whether some form of record of performance will be developed that will attract extensive participation of swine breeders remains to be seen. A great deal of talking and some experimenting are being done, but to date there has been little interest among breeders in the development or use of a performance record as an aid to selection.

Questions

1. In what respect does procedure in the judging of swine differ most from that followed in judging beef cattle?

2. Name the six main divisions of the scale of points for the market-hog score card.

3. State the number of points assigned to each of the main divisions.

4. Why is the variation in price at which hogs of different market classes and grades generally sell comparatively small?

5. How does this affect the importance of judging in dealing in market hogs?

6. What is meant by the phrase "buying or selling by rail weight and grade"?

7. What are the advantages and disadvantages of this method of selling from the producer's viewpoint?

8. State four ways in which the selection of hogs for breeding use by observation may be supplemented.

9. Why is "performance" of special significance in selecting hogs for use as breeding stock?

10. What information should be included in an ideal performance record for hogs?

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CHAPTER XXIV

MARKET CLASSES AND GRADES OF SWINE

The market classes and grades of swine have been developed and brought into use in the same way in which the classes and grades of cattle were developed and brought into use. The class and grade terms for hogs grew out of common usage on the markets and were standardized first by the work of the Illinois Experiment Station[1] and later by the Bureau of Agricultural Economics of the U.S. Department of Agriculture.[2] The list of classes of hogs is shorter than the cattle list. There are also fewer subclasses. This is because hogs are generally raised from birth to market maturity on the same farm, so that when they go to market, the great majority are sold for immediate slaughter. A few pigs and sometimes thin, older hogs are purchased on the markets as feeders and taken out to be grown and fattened, after which they are returned and sold for slaughter. Rarely are hogs of any kind purchased on a large market for use as breeding animals. Swine raisers retain sow pigs of their own raising for brood sows or buy them from neighboring farmers or breeders. Sires are usually purchased from neighboring breeders. Following is the list of classes and grades for hogs as approved and recommended by the Bureau of Agricultural Economics of the U.S. Department of Agriculture.

The Market Classes.—In classifying, all swine are first divided into two groups according to age, as hogs and as pigs,

Hogs:	Pigs:
Slaughter hogs	Slaughter pigs
Feeder hogs	Feeder pigs

In market terminology, all young swine are classed as pigs until they reach the age of about four months, after which they

[1] DIETRICH, WILLIAM, Market Classes and Grades of Swine, *Ill. Agr. Expt. Sta. Bul.* 97, 1904.

[2] Market Classes and Grades of Live Stock, *U.S. Dept. Agr. Dept. Bul.* 1360, 1926.

are called "hogs." Size or weight may influence designation as a pig or hog to some extent. The pig is generally thought of as weighing less than 150 lb., and custom seems to label weights above 150 lb. as of hog caliber. The terms "gilt," "barrow," and "boar" are in common use to indicate specific sex condition. The term "gilt" means a young sow that has not yet produced a litter. A barrow is a male pig that was castrated at an early age. A boar is a male beyond the pig age. The term "sow" indicates a female that has produced a litter and the term "stag," a male castrated after he had reached sexual maturity. The terms "boar pig" and "sow pig" are commonly used to designate sex in very young pigs. Condition of flesh or degree of fatness is the basis for the division into the slaughter and feeder classes.

The Subclasses.—To understand the procedure followed in grouping swine into four classes and several subclasses listed below, it need only be remembered that the class is determined by the use that will be made of the animal and the subclass by the sex condition of the animals within each class.

Slaughter hogs:
- Barrows and gilts
- Sows
- Stags
- Boars

Feeder hogs:
- Barrows and gilts
- Sows

Slaughter pigs:
- Pigs
- Roasters

Feeder pigs:
- No subclasses

The subclass is used only when the sex condition affects the usefulness and selling price. In both slaughter hogs and feeder hogs, barrows and gilts are always classed together, because sex condition influences their usefulness so little that a price differentiation is not warranted.

In dealing in hogs and consequently in market reporting, the subclasses are commonly divided further on the basis of weight. Because variations in weight affect dressing percentage and desirability of the cuts of meat, weight limitations are often very closely drawn. Usually both in dealing and in market reporting the range in weight is specified, though the terms "light," "medium," and "heavy" are sometimes used to indicate approximate weights.

After hogs have been classified or grouped according to the use that is to be made of them, their sex condition, age, and weight, these groups are divided one step further according to grade or the degree to which they fulfill the requirements of their class, just as in grading cattle the grades of swine are based on form, condition, and quality. In the slaughter classes, condition or degree of fatness is of greatest importance, then form, and then quality. In grading in the feeder classes, form is given largest emphasis, then quality, and condition is of least importance.

The Grades of Swine.—The same grade terms used in grading cattle are used for the grades of swine except that the terms "cutter" and "low cutter" are replaced by the one term "cull" to indicate the lowest grade of slaughter hogs. The terms "cutter" and "low cutter" have a definite meaning as applied to cattle. Because nearly all hog carcasses are cut into wholesale cuts in processing, the term cutter would not have a similar meaning if applied to hogs.

Slaughter:	Feeder:
Prime	Fancy
Choice	Choice
Good	Good
Medium	Medium
Common	Common
Cull	Inferior

Prime.—To grade prime, a hog must be nearly perfect in form, finish, and quality. This grade is used only for barrows and gilts.

Choice.—To grade choice, a hog must be very good in form, in finish, and in quality. The choice hog generally lacks a little in form and may lack a little in smoothness and quality. Barrows and gilts, sows and slaughter pigs may be graded as high as choice. Feeder hogs and feeder pigs are graded choice if they are highly desirable in form, quality, and thrift. A few feeder pigs that show highly desirable form, quality, and particularly good growth for their age will be graded fancy, but this grouping is seldom used, because there are few feeder pigs that show all the qualities required for it.

Good.—Hogs of all classes and subclasses may be graded as high as good. Any hog or pig must be without serious faults in form and in the slaughter classes must be at least moderately

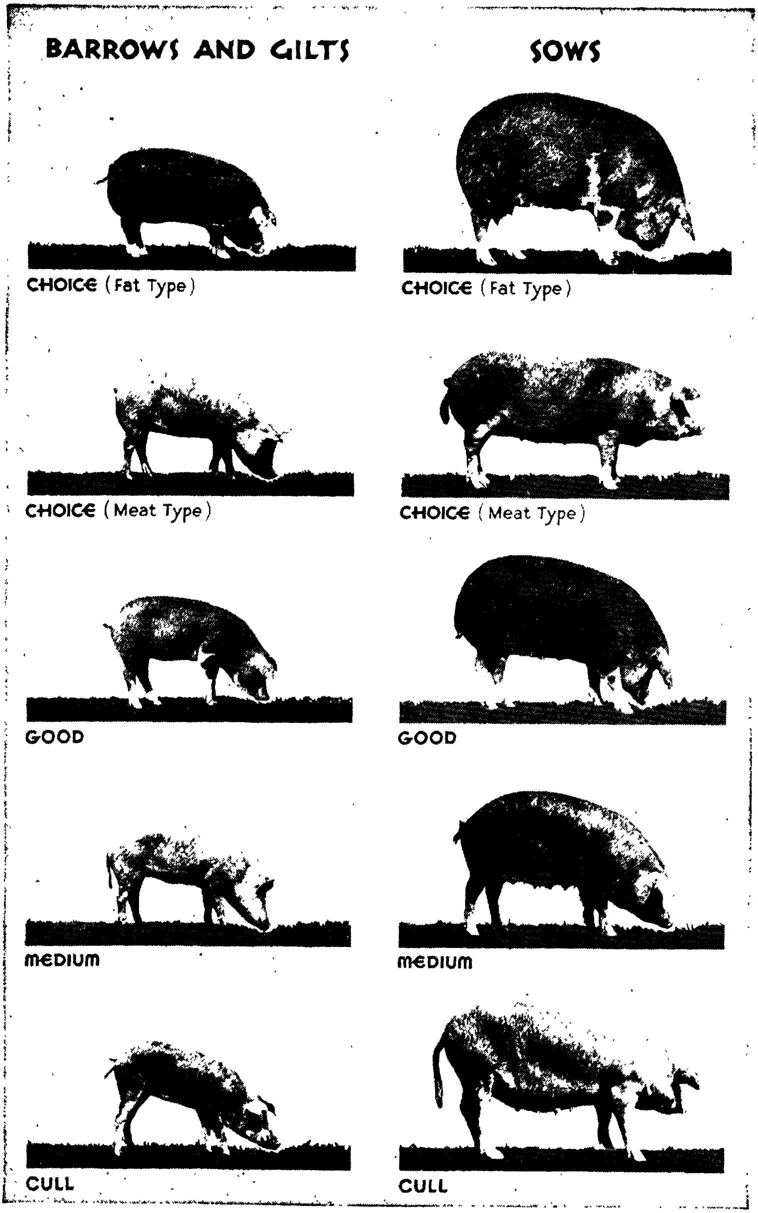

FIG. 54.—The market grades of slaughter barrows and gilts and slaughter sows. (*Courtesy of U.S. Dept. Agr., Agricultural Marketing Service.*)

fat, smooth in covering, and moderately fine in bone to grade good. To grade good in the feeder classes, hogs or pigs must be moderately good in form and in quality. They may be quite thin as long as they appear healthy and thrifty.

Medium.—The slaughter hog or pig grading medium will lack noticeably in form or may be quite good in form but lack noticeably in condition or quality. To grade as low as medium, a hog is generally lacking in at least two of the three essential qualifications. Feeder hogs or pigs grading medium are lacking in form and may also be coarse in bone, but must be healthy and thrifty in appearance.

Common.—A common slaughter hog or pig will be noticeably lacking in form and quality and may not be fat enough to make a desirable carcass. Feeder hogs or pigs grading common will be seriously lacking in form and quality and will also be quite thin in flesh.

Inferior.—The grade inferior is limited in use to the feeder classes. Hogs or pigs that would grade as low as inferior in the fat classes are termed "culls" instead. Few pigs that should be graded as low as inferior feeders are sold as feeders. They are, instead, placed in the cull grade and sold for immediate slaughter to be salvaged as best they can be.

Dockage.—Many hundreds of boars are used each year as sires, then castrated, fattened, and sent to market as stags. Many sows are marketed in an advanced stage of pregnancy. In order to eliminate the sorting out of stags and piggy sows and selling them separately, the practice of classifying and grading stags and piggy sows in with the class and grade they fit except for their sex condition is commonly followed on most livestock markets. Such stags and piggy sows then sell at the same price per pound and are weighed with the remainder of the hogs in the group, but in order to discount them to the satisfaction of the buyer, 70 lb. for each stag and 40 lb. for each piggy sow are deducted from the weight of the group. This procedure is called "docking" for stags and piggy sows. A special employee of the stockyards company or sometimes of the livestock exchange checks the groups of hogs as they leave the scales and decides the presence and number of stags or piggy sows in the group. In direct buying adjustment for stags and piggy sows is agreed upon directly between buyer and seller.

Table XIV is a sample hog-market report taken from a daily paper published in a city in which a large central market is located.

TABLE XIV.—HOG QUOTATIONS

Slaughter hogs, barrows, and gilts:	
Good to choice, 140–160 lb	$10.35–$10.50
Good to choice, 160–180 lb	10.40– 10.50
Good to choice, 180–200 lb	10.45– 10.50
Good to choice, 200–220 lb	10.45– 10.50
Good to choice, 220–240 lb	10.45– 10.50
Good to choice, 240–270 lb	10.30– 10.50
Good to choice, 270–300 lb	10.20– 10.40
Good to choice, 300–330 lb	10.15– 10.30
Good to choice, 330–360 lb	10.00– 10.25
Medium, 160–220 lb	10.25– 10.40
Sows:	
Good to choice, 270–300 lb	9.80– 9.90
Good to choice, 300–330 lb	9.80– 9.85
Good to choice, 330–360 lb	9.80– 9.85
Good, 360–400 lb	9.75– 9.85
Good, 400–450 lb	9.65– 9.80
Good, 450–500 lb	9.55– 9.70
Medium, 250–500 lb	9.40– 9.65
Feeders, pigs:	
Good to choice, 70–120 lb	10.50– 10.75
Good to choice, 120–180 lb	10.25– 10.75

Attention is called to the quoting of the two grades good to choice together and to the narrow range in price between the several grades. It may also be noticed that although a separate quotation is given for several narrow specified weight ranges, the price does not vary greatly from one weight range to the next. This hog-market report was taken from a period during which numbers coming to market were small, the market was rising rapidly, and prices were affected by heavy government buying of pork and lard. This all created a situation favorable to a smaller than normal spread between the high and low grades as well as between the lighter and heavier hogs. Stags are not quoted on this market, because they sell in with barrows and gilts or sows under the dockage plan. Boars generally are not quoted, because so few are marketed, and when they do appear they sell according to age and weight and at very low prices. Slaughter pigs and roasters are not quoted, because at the season of the year covered by this market report there were

practically no typical slaughter pigs arriving. Roaster pigs are small fat pigs six weeks to three months old. They are a specialty for which both supply and demand are limited, and they are seldom quoted in a market report. Attention may also be called to the slightly higher quotation for good-to-choice feeder pigs than for good-to-choice slaughter barrows and gilts. This is due to the high hog prices prevailing and the rapidly rising market conditions that sometimes cause feeder-pig prices to go above slaughter-hog prices.

Use of Market Classes and Grades of Hogs.—The classifying and grading of hogs serve identically the same purposes as the classifying and grading of cattle. These uses are (1) as a measuring stick on which both buyer and seller may base evaluations, (2) as a vocabulary in market reporting, (3) as a guide to producers in shaping their production to meet the market demand effectively, (4) as a standard to ensure fair dealing when hogs are purchased by class and grade without being seen by the buyer, (5) on large markets, as an aid in developing uniform practices in dealing and uniform prices for hogs of the same class and grade.

Questions

1. Name the market classes of swine.

2. Name the subclasses of the swine-market classes.

3. What is the basis for determining the subclasses?

4. State two ways in which weight may be indicated in dealing in market hogs and in market reporting.

5. Name the market grades for the slaughter and for the feeder classes of swine.

6. What characteristics must be closely observed in grading slaughter hogs? Feeder hogs?

7. What is meant by the term "dockage" in dealing in market hogs?

8. Cite several sample quotations from a standard hog-market report.

9. What are the principal purposes served by the classification and grading of hogs?

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SECTION V

Sheep and Goat Production

CHAPTER XXV

THE PRODUCTS AND ADAPTATIONS OF SHEEP AND GOATS

THE SHEEP INDUSTRY

Wool and meat are the two major products of sheep. Wool was the first fiber used in the manufacture of cloth. The pelt, or skin with the wool on it, probably was used for clothing long before man learned to make cloth from the wool. Under early domestication sheep were so highly valued for their wool that most lambs were grown to maturity and kept for the production of wool. There were other satisfactory sources of meat but none of fiber for clothing. Early attempts in the improvement of sheep were directed largely toward improvement of quality and quantity of wool produced. Sheep did not become an important source of meat until increased numbers and competition from other fibers reduced the demand for wool. This, together with mounting prices for meats, encouraged the use of sheep as a source of meat. For the last hundred years, especially in the United States, Great Britain, and several other countries, sheep have grown steadily in importance as a source of meat, with diminishing importance as a source of fiber. This has been accompanied by a reversal of emphasis in selection toward a type of sheep suited first to the production of lambs of desirable meat form, with quality and amount of wool a secondary consideration. The fleece of wool shorn from the ewe flock once each year now has a gross value amounting to from one-fourth to one-half the gross value of the lambs. In Range production, where lambs are sold as feeders, the wool clip may sell for one-

half or a little more than one-half as much money as the lamb crop. In farm-flock production, where the lambs are grown to finished market weights, the wool clip will sell for only about one-fourth the amount of money secured from the sale of the lambs. Normal fleece weights of about 12 months' growth vary from 7 to 15 lb. of unwashed wool. An average clip of 9 lb. of wool per sheep is considered a good yield.

A type of sheep suited to the production of fur has existed, particularly in the Asiatic countries, for many years. Recently one strain or breed of this type, the Karakul, has attracted world-wide attention, and foundation animals have been imported into many countries of Europe and the Western Hemisphere.

Lamb and Mutton.—Young sheep under one year old are called "lambs." The carcass or meat of the young sheep is called "lamb." Lambs, if properly fed and cared for, reach a suitable slaughter weight of 75 to 100 lb. when they are from six to nine months old. Nearly all lambs except those kept for breeding stock are marketed for slaughter at ages under one year. This is because the flesh of the lamb has a much milder flavor and is more tender than the flesh of mature sheep. Lambs and sheep vary in dressing percentage from a low of 45 to a high of 55 per cent. Lambs and sheep yield the lowest percentage dressed weight of the three important kinds of meat animals. The form, the amount of fat, and the condition of the pelt are the important factors influencing the dressed-carcass weight. If slaughtered soon after shearing, the dressing percentage will be high, whereas if slaughtered with a long, heavy fleece growth the dressing percentage will be low.

Per Capita Consumption.—Lamb and mutton are meats of high flavor. Their flavor is not so generally liked as the flavor of beef or pork. As a result, in most countries their consumption is much smaller than the consumption of beef or pork. Consumption of lamb and mutton is largest in those countries where conditions favor the economic production of sheep and smallest in countries where other kinds of animals can also be economically produced. The consumption of lamb and mutton is influenced to some extent by religious beliefs. For instance, in India, where beef is not eaten, lamb and mutton to some extent take its place. Orthodox Jewish people, who do not eat pork, eat larger amounts of lamb and mutton. A further factor influencing

lamb and mutton consumption is a preference for its taste found among the people of some countries and not in others. An example is the high per capita consumption of 30 lb. of lamb and mutton per person per year in Great Britain. There is no reason why the people of Britain should eat so much lamb and mutton except that they like it and buy it by choice. In contrast, per capita consumption in the United States is only 6.6 lb. per person per year. The principal reason for this low consumption is that many people in the United States do not like lamb and mutton and by choice buy beef and pork instead.

In some countries, especially in the United States, lamb often sells to the consumer at prices higher than the price of beef or pork of similar grade so that price is sometimes a factor curtailing consumption. Mutton is a low-priced meat but is not relished sufficiently to create a large consumption of it. The locally produced lamb and mutton supply of the United States has, during the last hundred years, adjusted itself to the home demand. As a result, lamb and mutton have been neither exported nor imported in appreciable quantity. Average per capita consumption in 1938 was 6.6 lb. About 24,000,000 sheep and lambs were slaughtered.[1]

By-products from the Processing of Sheep and Lambs.—The pelt, or skin with the wool on it, is the most valuable by-product resulting from the slaughter of sheep and lambs. In disposing of the pelt, processing plants generally sell it to a wool-pulling plant or operate one themselves. In the wool-pulling plant, the exposed skin surface of the pelt is painted with a thick, strongly alkaline paste, which loosens the fibers in a few hours' time. The fleece is then easily separated from the hide by pulling or rubbing it off with the hands. This wool, known on the market as "pulled wool," is used in the manufacture of cloth or felting according to its length. Much of it is so short that it does not have a high value. The skin is put through the tanning process and used in making chamois skins and fine-quality leather goods such as gloves, jackets, and belts. A few pelts carrying a dense fleece of fine-quality wool, taken from sheep and lambs slaughtered when the wool had made a growth about an inch long, are given special treatment and used in making sheep-lined coats and other wearing apparel.

[1] *U.S. Dept. Agr. Market Statistics*, 1939.

The liver and heart are the principal edible by-products of sheep. The head, lungs, blood, and intestines are made into tankage, meat meal, and bone meal. The small intestine of sheep and lambs has a special use as sausage casing and is a by-product of appreciable value.

Wool.—The fleece of wool shorn from the live sheep once each year is a major product and should not be considered a by-product of the sheep industry. The United States has never produced enough wool to supply fully the need of the country for this fiber. Wool in varying amounts is imported each year. For many years about as much additional wool as the amount produced had to be imported. The annual consumption of wool in the United States during the last hundred years has varied between 500,000,000 and 700,000,000 lb. Imports of from 250,000,000 to 350,000,000 lb. were required. Until about 1925 the finer grades of wool from Australia and New Zealand comprised the larger part of the imports. Since then imports of wool have been on the decline, partly because of increased production at home and partly because of the larger use of wool substitutes. In 1938 importations totaled only about 100,000,000 lb. This wool came largely from China and Japan and was coarse wool used in the manufacture of coarse plush cloth for automobile lining and seat covering. The present-day principal use of wool is in the manufacture of suiting goods, overcoats, hats and caps, blankets, plush cloths for furniture and automobile upholstering, and in carpet- and rugmaking. Cotton, silk, rayon, and other fibers are preferred for undergarments, dress goods, hosiery, and many articles formerly made from wool. Throughout most of the history of the United States, wool growers have been protected by a moderate tariff on imported wool.

Fur from Lamb and Sheep Pelts.—Broadtail, Persian lamb, and caracul furs are high-quality costly furs made from the pelts of very young lambs. Lamb pelts used in the manufacture of such furs have been produced mainly in several Asiatic countries. In these countries large areas of land are suited only to the raising of hardy sheep of poor mutton form. The Karakul,[1] a strain in which the fleece of the lamb at birth is jet black, possesses a high luster, and curls in small, tight ringlets,

[1] Potts, C. G., Karakul Sheep, *U.S. Dept. Agr. Farmers' Bul.* 1632, 1930.

is the leading strain of sheep maintained for the production of fur pelts. There are other Asiatic sheep, but the Karakul is the only one that has been introduced in the United States. Lamb and sheep pelts from older sheep of the types commonly used in mutton and wool production are manufactured into linings for coarse outdoor overcoats. The "sheep-lined" overcoat is a popular article of wearing apparel used extensively in the Northern states during the winter months by men who must be outdoors a great deal.

Milk from Sheep.—In some countries the milk of sheep is used as a human food in place of cow's milk. Sheep's milk is highly prized for the making of certain kinds of cheese, notably the French Roquefort. A considerable quantity of this cheese formerly was imported to the United States, where it was the highest selling cheese on the market. Sheep are not used for milk production in the United States.

TABLE XV.—EXPORTS AND IMPORTS OF SHEEP, MUTTON and LAMB, AND WOOL, 1890–1938—DECENNIAL YEARS ONLY*

Year ending June 30	Exports			Imports		
	Live sheep, 1,000 head	Mutton and lamb, 1,000 lb.	Wool, 1,000 lb.	Live sheep, 1,000 head	Mutton and lamb, 1,000 lb.	Wool, 1,000 lb.
1890	68	257	231	394	......	105,431
1900	125	774	2,200	382	86	155,928
1910	45	1,989	48	126	722	263,928
1920	59	3,958	6,991	200	16,358	427,578
1930	16	1,260	247	9	1,924	220,476
1938	2	552	1,104	8	37	113,137

* *U.S. Bur. Agr. Econ. Marketing Service, Market Statistic Report*, p. 40, 1939.

The Adaptations of Sheep.—Sheep have a broad adaptation to successful production under varying environmental conditions. They may be successfully and profitably produced on the highest and roughest mountain lands where vegetation grows and on the lowest land from which the water can be drained. They are profitably grown on the most fertile lands and on the most desert-like lands on which any vegetation will grow. They are successfully produced in cold and in warm climates. In promoting sheep raising under the many and varied environments several

distinct types and many breeds, each with one or more characteristics valued for some specific adaptation, have been produced. All the breeds commonly produced in the United States classify under two rather distinct types; (1) sheep of mutton type and (2) sheep of fine-wooled type. Sheep of the fine-wooled type were the first to be introduced in the United States and were for many years the only type maintained. The decline in wool prices and rise in demand for lamb, taking place around the year 1850, brought about the importation from Great Britain of foundation animals of many breeds possessing well-defined mutton qualifications and led to the rapid rise of the mutton or meat type to popular favor. The continually growing importance of the slaughter lamb as the product of greatest value from sheep led to the placing of more emphasis on the breeding of sheep with good mutton form, until now sheep of fine-wooled type have been replaced by sheep of mutton type in all areas of the country where feeds suited to the production of slaughter lambs are available. Sheep of the fine-wooled type are still grown in localities where the vegetation is sparse and where herding in large bands is the management practice followed. Under this management method, effort has been made to improve the fleshing qualities of the fine-wooled sheep, and the lambs are now considered the more important product of the flock. They are sold as feeder lambs or, when possible, as slaughter lambs.

Adaptations of the Mutton Type.—Sheep of the mutton type are most favorably located in areas where grazing is luxuriant and feeds for winter maintenance and for the fattening of lambs plentiful. The American Corn Belt is a natural location for mutton sheep, yet most Corn Belt farmers have not taken up extensive sheep production. The principal reason is that even sheep of the mutton type are most profitably maintained largely on pasture and hay and do not provide a market for much corn. To date, Corn Belt farmers have looked upon the raising of sheep as an opportunity to conduct a small side-line enterprise, using the sheep primarily to graze grass and weeds about the farmstead during the summer months. The maintenance of a small flock is considered an opportunity to add a little to the farm income without adding much to the cost of operating the farm. This advantage of the small ewe flock on all except the smaller

Corn Belt farms is questionable. It is probable that there would be a better, more profitable sheep industry in the Corn Belt if more farmers made sheep production a major enterprise and fewer maintained small flocks. Care and management practices are often very poorly carried out in the maintenance of the small farm flock. The trend, however, during the last twenty years has been toward an increase in the number of both small and large ewe flocks on Corn Belt farms.

The raising of sheep of mutton type is adapted to many farms outside the Corn Belt in areas of good pasturage, where a readily available supply of suitable roughage for winter feeding may easily be provided. New York, Pennsylvania, and Ohio comprise one such area; the Southern states, particularly Kentucky, Tennessee, the Virginias, and the Carolinas, comprise another.

Aside from the maintenance of sheep as the major livestock enterprise on a farm, the breeding flocks may be combined with the maintenance of the breeding herd of beef cattle, the dairy herd, or with swine raising as a suitable secondary livestock enterprise. Because they have the same feed requirements sheep have no supplementary value when combined with beef cattle except as a protection against a possible low-price period for beef cattle, during which the price of sheep and wool might remain on a profitable basis. The cattle might protect the sheep in the same way. It is doubtful if this advantage is large enough to justify the two enterprises on the same farm. Sheep raising often is used to supplement dairying on farms where the labor supply is not sufficient to handle a large dairy herd. A flock of sheep may be added to such a farm to advantage to utilize surplus pasture and roughage. Sheep rather than beef cattle may be maintained along with hogs on farms where the operator prefers to use all the corn or grain available to feed to the hogs.

Adaptations of the Fine-wooled Type.—The first fine-wooled sheep brought to America were distributed mainly in the New England states. Later extensive production developed in Pennsylvania and Ohio. These two regions have persisted in producing sheep of the fine-wooled type, though most of the area is also well suited to the raising of sheep of mutton type. After having apparently served their greatest usefulness during

the period 1800–1850, fine-wooled sheep began to be replaced by sheep of mutton type. The opening up and settlement of the vast semiarid and mountainous region of the West and Southwest, followed by the development of cattle and sheep ranching, then gave the production of fine-wooled sheep renewed importance. Cattle ranching began in the Southwest about the year 1850. By 1880 the entire Range area from the Gulf of Mexico to the Canadian border was almost completely stocked with cattle. The several succeeding years happened to be years of more than average rainfall, with abnormally mild, open winters. This led to overstocking of hundreds of large ranches with cattle. A dry summer during 1886, followed by a severe winter, with heavy snowfalls covering what vegetation there was, caused the death by starvation and freezing of many entire herds of Range cattle.

By this time sheep ranching had been tried in a small way and seemed to offer almost as large an opportunity for financial profit as cattle ranching, with a much smaller risk. The foundation stock represented a smaller investment, sheep were more efficient in grazing the poorer ranges, and death losses under adverse winter conditions were smaller. As a consequence, following the disastrous winter of 1886–1887, many of the former cattle ranches were restocked with sheep rather than with cattle. The entire Range area was first stocked with sheep of the fine-wooled type for three reasons:

1. During this period wool was still the product of greatest value from sheep maintained under ranch-management methods.
2. Fine-wooled sheep possess the habit of staying together in dense groups when grazing. This "banding instinct" is not pronounced in sheep of the mutton type, and because of their tendency to scatter it has never been practical to try to herd sheep of mutton breeding in large bands.
3. Sheep of the fine-wooled type were the only kind available in large numbers at the time the Range was being stocked.

Sheep ranching throughout the Range area increased rapidly during the period 1885–1900. It was soon found that sheep have a slight advantage over cattle for the grazing of many types of Range lands, such as rough mountainous or hilly regions, in forests, on short grass Ranges, and on Ranges where weeds and grasses not palatable to cattle comprise the predominant vegeta-

tion. Early in the development of sheep ranching it was found that even the lambs of fine-wooled breeding could be sold as feeder lambs with greater profit from the enterprise than was secured by retaining the lambs and marketing wool only. There has always been a demand from feeders who buy Range-raised lambs to fatten for lambs of better mutton form. Since about the year 1900 Range sheep producers have tried in many ways to improve the size and mutton form of their lambs without loss of the banding instinct, the hardiness, grazing ability, and fine, dense, close-surfaced fleece so necessary to economical Range production. As a result of these efforts nearly all Range sheep now carry some admixture of mutton breeding with the fine-wooled breeding. At present about 75 per cent of all lambs raised in the United States are produced in the Range area. The total number of sheep in the United States is about 50,000,000.

Lamb Fattening.—Early in the development of sheep ranching, it was found profitable to fatten Range-raised lambs before slaughter. Since feeds for fattening are not available in the Range areas, the lambs are sold as feeders during the fall months, when they weigh from 50 to 70 lb. They are purchased by farmers in the Corn Belt and other areas where feeds for fattening are available. A feeding period of 75 to 100 days is required to fatten the average feeder lamb. A normal gain in weight during the fattening period is 30 lb. per lamb. Thus a large part of the lamb production is carried out in two distinct phases: (1) raising the lamb on the Range and (2) fattening on farms in mixed farming areas.

The lamb-fattening enterprise has a somewhat broader adaptation than cattle fattening. Whereas corn is the most desired grain for fattening lambs, they may be fattened very successfully on the small grains, screenings, beet pulp, molasses, and other commercial by-product feeds. Lambs are able to use a slightly higher proportion of good-quality roughage in the fattening ration than cattle. The best cattle-fattening rations must be two-thirds concentrate and one-third roughage. Good lamb-fattening rations may be one-half concentrate and one-half roughage. The supply of feeder lambs coming from the Range area is augmented by a considerable number of lambs sent to market in feeder condition from farm flocks throughout the country. During recent years, lamb fattening has been con-

sistently profitable, and the only limitation to its expansion has been the number of suitable feeder lambs available. Much of the lamb fattening is done by large operators who specialize in this enterprise and fatten thousands of lambs annually.

THE GOAT INDUSTRY

Goats resemble sheep in size and to a lesser extent in form. They have much the same feed requirements and require similar housing and care. There are two distinct types, the Angora and the milk goat.

The Products from Goats.—The principal product of the Angora goat is the fleece of long, wavy, fine, soft hair, called "mohair." The average weight of a mohair fleece is 4 to 5 lb., although fleeces weighing 8 to 10 lb. are secured from the best purebreds. Mohair differs from ordinary hair in having a rough, serrated surface, produced by the horny, scalelike cuticle cells. The fibers are long and strong and at the same time soft and silky in character. Mohair can be readily spun into fine, strong yarn. The high luster or shiny-appearing character of the mohair fiber adapts it to dyeing with dyes of sharp bright colors. Mohair will absorb more dye than wool and consequently holds color better than wool. Because of these qualities and a lower shrinkage than wool in cleaning and combing, fleece mohair generally sells at a price somewhat higher per pound than fleece wool. It is used principally in making upholstering cloths, men's summer suits, and lining materials.

The principal product of the milk goat is the milk produced. The milk goat has short hair of no fleece value. The milk is very similar to cow's milk and may be used in place of cow's milk for all purposes. The better milkers produce from 1 to 2 qt. per day. A few records much larger than this have been made.

Goat's milk tests from 3 to 6 per cent fat. The fat is white in color and the fat globules small in size. The fat remains distributed through the milk and does not rise to the top so completely on standing as with cow's milk. Cream separators are just as effective in separating it as in separating cow's milk. The milk is used principally for consumption as whole milk and in cheese making. It is seldom used for making butter. Several

popular brands of cheese are made from it. Contrary to common opinion, the famed French Roquefort cheese is made from sheep's milk and not from goat's milk.

The flesh of both Angora and milk goats, called "chevon," is used as meat. It is a highly flavored meat, resembling mutton and lamb, but is stronger in flavor and is not relished by many people. The carcass of both Angora and milk goats is a by-product rather than a primary product. With each type, most of the female goats, called "does," are grown to maturity and used as breeding stock until they have served their normal life of usefulness. They are then sent to market, where they are slaughtered and salvaged by the packing companies. Many male goats of both types are castrated when a few days old, grown to the age of six to nine months, and sold for slaughter. When the goats are slaughtered at this age, the meat is quite similar to lamb.

By-products.—The principal by-product resulting from the slaughter of goats is the skin. Raw goatskins are worth about 50 cents each. They produce a soft, oily leather especially suited to making the cheaper grades of gloves, shoes, and pocketbooks. Domestic production is estimated at 175,000 goatskins annually. From 75,000,000 to 80,000,000 lb. is imported annually, most of the imports coming from South Africa.

Adaptations of Goats.—Although Angora and milk goats have many characteristics in common, they are maintained for entirely different purposes, are found in different locations, and require different management methods.

Adaptation of the Angora.—Angora goats are maintained in place of sheep in large Range areas where the vegetation is of the brush-range type and is better suited to grazing by goats than by sheep. They are used in many other parts of the country to graze brushlands and are found useful in helping to clear the growth from such lands, preparatory to bringing them under cultivation. The annual clip of mohair is of sufficient value to show a profit when the feed cost is kept low. There are about 3,000,000 Angora goats in the United States, including purebreds and grades. Most of them are in large bands. They are found in largest numbers in Texas, Arizona, New Mexico, California, Oregon, and Missouri. Texas has about 65 per cent of the total number.

Adaptation of the Milk Goat.—In many countries where living standards are lower than in the United States, milk goats are kept in place of the "family cow." One or two goats can be maintained on the back lot and fed on the refuse from the table, with the purchase of very little additional feed. A few people, principally those who have immigrated to the United States from countries where they were accustomed to goat's milk, like to use it in preference to cow's milk. Used in this way, it is logical that milk goats should be scattered throughout the country rather than centered in a few localities, as are the Angoras.

There are a few large goat dairies where large herds are maintained and operated similar to a herd of dairy cattle. From some of the large dairies, whole milk is sold, from some the milk is used in making cheese, and from a few, condensed milk is made. An estimate of the number of milk goats in the country is largely a guess. Compared to Angoras, the number of milk goats is small and is of less importance.

Questions

1. What are the principal products of sheep?

2. Why were sheep of the fine-wooled type bred for improvement at an earlier date than sheep of mutton type?

3. What should be the weight of a typical fleece of wool? At what weights are lambs usually slaughtered? What is the dressing percentage of lambs and sheep?

4. What is the annual per capita consumption of lamb and mutton in the United States? In Great Britain?

5. What are the important by-products resulting from the slaughter of lambs and sheep?

6. Does the United States export or import wool?

7. How do you account for the wide distribution of sheep raising in so many countries?

8. Why were sheep of the fine-wooled type used in stocking the Range sheep-producing area?

9. Why are Range sheep producers now striving to improve the mutton form of their sheep?

10. With what other types of farm livestock may sheep raising be combined to advantage in mixed farming areas?

11. What has been the basis for the development of the specialized lamb-fattening enterprise?

12. How does the feed requirement of the fattening lamb differ from that of fattening cattle?

13. What are the principal products from goats?

14. To what extent is each of the two principal goat types adapted to production in the United States?

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CHAPTER XXVI

BREEDING SHEEP AND GOATS

Sheep have been maintained under domestication for many centuries, yet little is recorded in history concerning their original habitat or characteristics preceding domestication. It is probable that when first domesticated, sheep were valued for their skins, and for the wool covering for use as clothing rather than for meat. It is known that they were also valued for milk production. Early sheep were of inferior mutton form, and little attention was given to improvement of mutton form until the beginning of the industrial age created a larger demand for meat and attracted attention to the sheep as a source of meat. Although attention had been given to improving the quality of wool largely by selection for some centuries, it is only during the last 200 years that attempts to improve the mutton form of sheep have shown progress.

Pronounced early progress in the improvement of wool was made first in Spain and later in France, and marked improvement in mutton form was first made in Great Britain. The fine wool type had been well fixed by about the year 1800, and except for some increase in size, improvement in mutton form, and further increase in fineness and length of fleece, fine-wooled sheep today possess much the same characteristics of fine-wooled sheep of 150 years ago. The development of the mutton type, on the other hand, resulted in the production of many breeds possessing wide variations in wool character, color markings, and size but all having one characteristic in common, a wide, deep body, more compact form, and thick covering of natural flesh, with ability to fatten quickly when well fed.

Following formation of the pure breeds, improvement in sheep has been secured (1) by perfecting of the breeds through selection toward a definite standard as described by breeders' organizations, (2) through the practice of inbreeding, and (3) in a few instances, by the crossing of breeds already established, then developing a new breed from the crossbred stock. Improve-

ment of the general sheep stock has then been secured by the use of purebred sires of the improved pure breeds on the common ewe stock. This has been a universal procedure.

THE PURE BREEDS

Many breeds of sheep have been developed in different countries. Most of them seem to have a specific adaptation to rather limited environmental conditions, though the distinguishing characteristics among some of them seem trivial and unimportant. Many of the breeds have met with small favor outside the rather narrow limits of their place of origin; others have obtained world-wide distribution. Representative sheep of many pure breeds have been imported to the United States to establish breeding flocks, but only a few breeds have attracted popular favor and attained wide distribution.

The Fine-wooled Breeds.—The first sheep of improved breeding brought to the United States were of the fine-wooled type. They were brought from Spain early in the nineteenth century.

The Merino.—In the beginning, the Spanish sheep were designated by a variety of names given them according to the flocks in Spain from which they originated. Later they all came to be known as "Merino" sheep, the name being the title of a Spanish governmental officer who assigned grazing lands to the different bands of sheep in Spain.[1] Although the Merino sheep imported during the period 1800–1820 were the best wool-producing sheep then known to exist anywhere in the world, they would be considered very inferior sheep when contrasted with sheep of approved fine-wool type in America today.

In the United States, as in a number of other countries that secured their first sheep from Spain, marked improvement in them was made following their importation. Interest in the breed in America followed the condition of the wool market, with the result that there have been about four short periods of expansion and high prices and about the same number of periods of somewhat longer duration during which interest in the breed lagged and low prices prevailed. The Merino breed experienced its last period of expansion from about 1870–1900, when the Range was stocked with sheep.

[1] Vaughan, H. W., "Breeds of Live Stock in America," p. 290, R. G. Adams & Company, Columbus, Ohio, 1931.

REGISTRY ASSOCIATIONS.—Prior to the stocking of the Range, Merino sheep breeders in the Eastern states had been selecting for larger size, fewer wrinkles in the skin, better mutton form, and longer and heavier shearing fleeces, at the same time attempting to retain the fine wool quality of the early Merinos. Marked progress was made in this direction, but it was handicapped by failure of breeders to get together in a strong national organization. Instead, a number of small registry associations were formed, each with minor differences in the requirements for

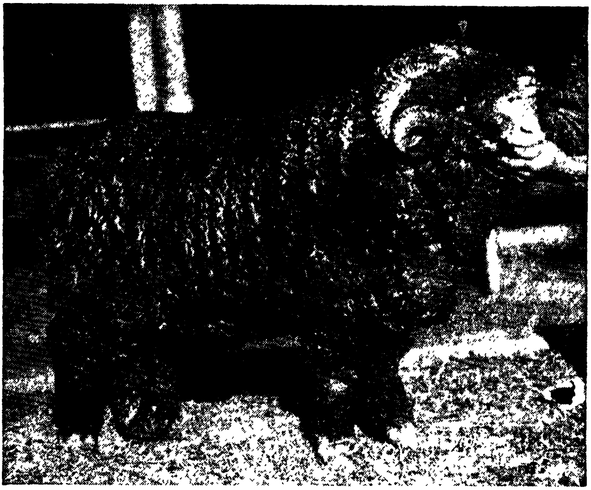

FIG. 55.—An "*A*" type Merino ram. (*Photograph by Strohmeyer.*)

registration. It was not until the year 1906 that a number of the small associations merged into the American and Delaine Merino Record Association, and now it is the one association registering Merino sheep in any appreciable numbers. The office of the secretary is at Xenia, Ohio.

MERINO TYPE.—The present-day Merino type calls for a sheep of medium size, possessing a fine, long, dense fleece with the hair on the legs and face white. Wool covers the legs practically to the toes and the entire face except for a small area just above the nostrils. Merinos may possess a skin condition ranging from very wrinkled to entirely smooth. In the leading exhibitions they are classified into three groups on the basis of the amount of wrinkling they show. The three groups are designated *A*, *B*, and *C*. The *A* group covers those wrinkled

over the entire body; the *B* group, those wrinkled chiefly about the necks; and the *C* group, those without noticeable wrinkles. Merino rams have horns; the ewes do not.

The Rambouillet.—About the time the first large importations of Merino sheep were being brought to the United States, Merinos were also being taken into France from Spain. Breeders in France at once began to select for larger size, greater freedom from wrinkles, and better mutton form. In time, the French breeders developed a type that did show marked improvement in these qualities. This French type of sheep was given the name "Rambouillet," taken from the name of a town at which a government experimental sheep farm was located.

As wool began to lose its position as the more important product from sheep, and lamb began to be the product to which all sheep producers in the United States had to look for the larger part of their income, it was natural that they should become interested in finding a type of sheep that would produce good mutton lambs. This need was supplied in the Corn Belt and other sheep-producing areas by the importation of sheep from the newly formed British mutton breeds. Range producers soon found, however, that because of their open fleeces, poor grazing ability, and lack of the banding habit, sheep of the British mutton breeds were not well suited to Range production. In looking further for a better Range type, ranchers as well as breeders in the Eastern states who still favored the fine-wooled type began to import the Rambouillets, or French Merinos, as they were sometimes called. The Rambouillet did prove a better sheep for the rough lands of the East and for Range production. They were larger, had better mutton form, fewer wrinkles, possessed the banding instinct, and still possessed a close-surfaced fleece, not quite so fine as the Merino's but longer and heavier shearing. Rambouillet rams were used on Merino flocks, and during the period 1880–1910, many purebred Rambouillet flocks were established. Most of the foundation stock for these flocks came from France, but a good many Rambouillets were imported from Germany, where a type slightly superior to the French Rambouillet had been developed.

There are now many flocks of sheep in the Eastern states and on the Range that were started on a Merino foundation on which Rambouillet rams have been used to the exclusion of

Merino rams during the last thirty to forty years. Purebred Rambouillet flocks to produce these rams have almost completely replaced purebred Merino flocks.

REGISTRY ASSOCIATION.—The American Rambouillet Sheep Breeders' Association was organized in 1889. There has been only the one association in which all Rambouillet sheep have been registered. The office of the secretary formerly at Marysville, Ohio, was recently moved to Ozona, Tex.

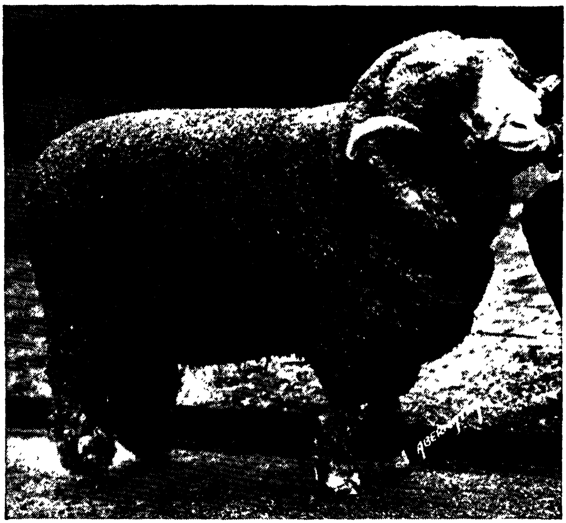

FIG. 56.—A prize-winning Rambouillet ram. (*Photograph by Abernathy.*)

RAMBOUILLET TYPE.—The typical Rambouillet sheep of today combines good size and good mutton form with a heavy-shearing fleece of fine-quality wool of good length. As with the Merino, the small amount of hair that may be seen at the lower extremity of the legs and above the nostrils is white. Many Rambouillet sheep show some wrinkling of the skin about the neck, but complete freedom from wrinkles is preferred. The rams in the breed usually have large, heavy, curled horns, whereas the ewes are without horns. Some Rambouillet rams are naturally polled. Ram lambs castrated at an early age do not grow horns.

It is claimed for the Rambouillet that in addition to having the most highly perfected combination of mutton form and wool

production, it is adapted to all climatic and environmental conditions and will thrive equally well under Corn Belt or Range production.

The Mutton Breeds.—During the period from about 1800 to 1860, while the Rambouillet was being perfected in France and Germany, sheep growers in Great Britain were perfecting a number of breeds of sheep in which mutton form was set up as the primary qualification, with wool a secondary consideration. Each of the several British mutton breeds was developed by a few breeders in a small area. The several breeds differed widely in size, in fleece character, and in color markings. The list of British breeds from which foundation animals have been imported to the United States and attained sufficient prominence to be of appreciable significance in this country includes the Shropshire, Southdown, Hampshire, Oxford, Dorset, Cheviot, Suffolk, Lincoln, Cotswold, and Leicester. Representatives of each of these breeds have been imported to the United States and purebred flocks established here. However, only the Shropshire, Southdown, and Hampshire have met with general favor for use in grading up the sheep of the Corn Belt.

The Shropshire.—Of all the breeds of mutton sheep, representatives of which have been imported to the United States, the Shropshire has met with by far the most general favor and has attained the widest distribution and the largest use in grading up common stocks of sheep for mutton-lamb production. The Shropshire first became known as a distinct type in Shropshire County in central England. It was developed by selection from the stock of sheep native to this area about the year 1800. The foundation stock is described as a sheep of small size having a black or brown spotted face, horns, and a coarse, short, light-shearing fleece. It is thought that rams of the Southdown, Cotswold, and Leicester breeds, already recognized as pure strains, were crossed upon the stock common to Shropshire County in the early improvement and formative period of the Shropshire breed.

Registry Associations.—The breed was first recognized as a pure strain about 1850, though the British Registry Association was not formed or registration begun until 1882. Importations of consequence began to be made to the United States about 1880. The American Shropshire Registry Association

was formed in 1884. This association has been the only association formed to register Shropshire sheep in the United States. The office of the secretary is at Lafayette, Ind.

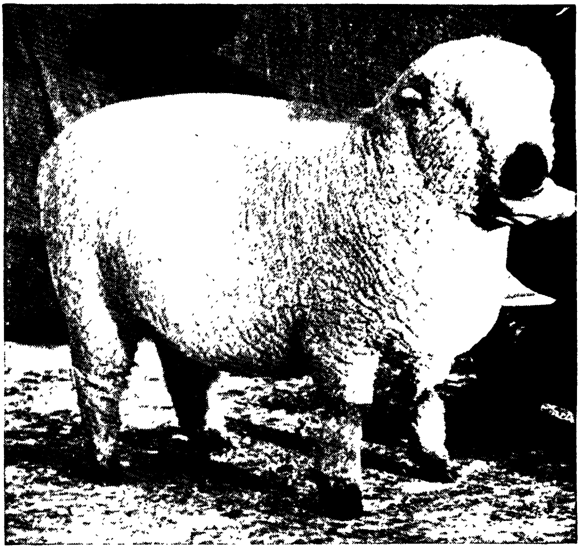

FIG. 57.—Champion Shropshire ewe, International Livestock Exposition, 1940. (*Photograph by Abernathy.*)

SHROPSHIRE TYPE.—The Shropshire of today has the nearest to an even balance of desirable mutton form with a heavy-shearing fleece of good quality, length, and density of all the breeds of mutton sheep. A typical Shropshire should be of medium size, short-legged, compact, with short, broad head, short neck, and a wide, deep body, thickly covered with natural flesh. A fleece of a full year's growth should be from 5 to 6 in. long, dense, and close on the surface, and should grade three-eighths to quarter blood in fineness. A typical fleece should shear from 8 to 10 lb. of unwashed wool. Wool covers the head down to the nostrils and legs down to the toes. What face, ear, and leg color shows should be dark brown to black.

The Hampshire.—Originating in Hampshire County in the south of England, the Hampshire holds second place to the Shropshire in numbers imported and number of purebred sheep of mutton type produced in the United States.

The early Hampshires were large, coarse-boned, with large heads, long, drooping ears, and a coarse, light-shearing fleece. Improvement was secured principally by crossing with Southdown rams, and this was followed by rigid selection. Hampshires were among the latest of the British breeds to be introduced into the United States, but since 1900 more of them have been imported than of any other mutton breed. Importations have continued because of the demand for increased numbers and because up to the present time it has been possible to secure sheep in England capable of contributing further improvement to American flocks.

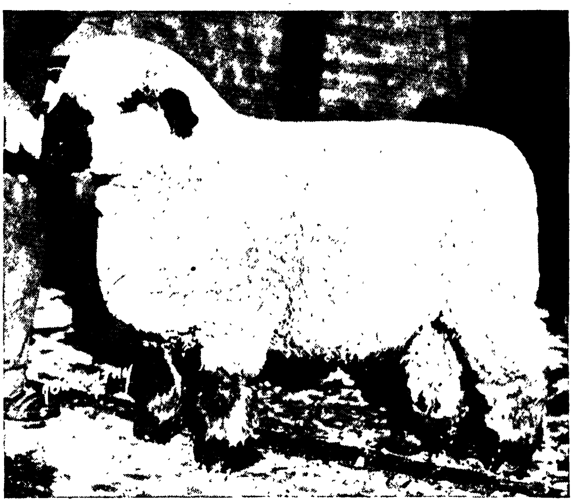

FIG. 58.—Champion Hampshire ram, International Livestock Exposition, 1940. (*Photograph by Abernathy.*)

In addition to becoming popular in the Corn Belt as sires of market lambs, Hampshire rams are in high favor with ranchers for mating to fine-wooled ewe flocks for the production of high-quality, rapid-growing feeder lambs. At present, Hampshire rams are selling for higher prices throughout the country for use as sires of market lambs than are rams of any other breed.

REGISTRY ASSOCIATIONS.—The British Hampshire Sheep Registry Association was organized in 1889, the American Hampshire Sheep Association in the same year. The office of the secretary of the American Association is at 72 Woodland Avenue, Detroit, Mich.

HAMPSHIRE TYPE.—The present-day Hampshire is a sheep somewhat larger than the Shropshire, with heavy bone in the legs and a big head with large ears carried nearly straight out from the head. Hampshires should be low-set, very wide and deep-bodied, compactly built, and thickly covered with natural flesh. The fleece is of medium length, should grade quarter blood, and be compact on the surface. Hampshires are not so thoroughly covered with wool on the face, belly, and legs as the Shropshire. Many breeders consider this an advantage, because the breed is free from the wool blindness, often present in the Shropshire. The face, ear, and leg color is very dark brown to black. Hampshire sheep are open to minor criticism because of the frequent presence of black fibers in the wool, because of frequent parturition troubles due to the large heads and heavy legs of the lambs, and because of the large feed requirement for maintenance of the ewes and fattening of the lambs. The ewes have a reputation as heavy milkers and nurse their lambs well.

The Southdown.—The oldest of all the pure breeds of mutton sheep is the Southdown. It is also credited as being the most nearly ideal in mutton form and quality of all breeds. The extreme southeast of England, the native home of the Southdown, was peculiar in that the land produced a heavy growth of short, nutritious grass that seemed especially suited to grazing by sheep. The topography was hilly. The hills were called "downs," and because of their location in the extreme south of England, they were known as the "South Downs." It is from this designation of its native home that the breed was given its name.

The Southdown has long been a sheep of small size, of good mutton form, covered with a short, dense, compact fleece grading three-eighths blood in quality. So far as is known, no outside blood has been introduced into the breed through the last 150 years or more. Improvement has been secured entirely by selection toward the desired type.

REGISTRY ASSOCIATIONS.—The British Registry Association, known as the Southdown Sheep Society of England, was formed in 1890. The American Southdown Breeders' Association was organized several years before this, in 1882. The office of the secretary is in State College, Pa.

SOUTHDOWN TYPE.—The typical Southdown today is an extremely wide, deep-bodied, compact, thick-muscled sheep, set on very short legs. The head is small and neat, the neck short and thick, and the fleece medium in length, fine, and dense. The hair of the face, ears, and legs ranges from a light brown to a light gray color, often designated as "mouse-colored." The face, ears, and legs from the knees and hocks down are free from wool covering.

The Southdown is at its best when bred pure or in flocks highly graded up to several generations of top-crossing of South-

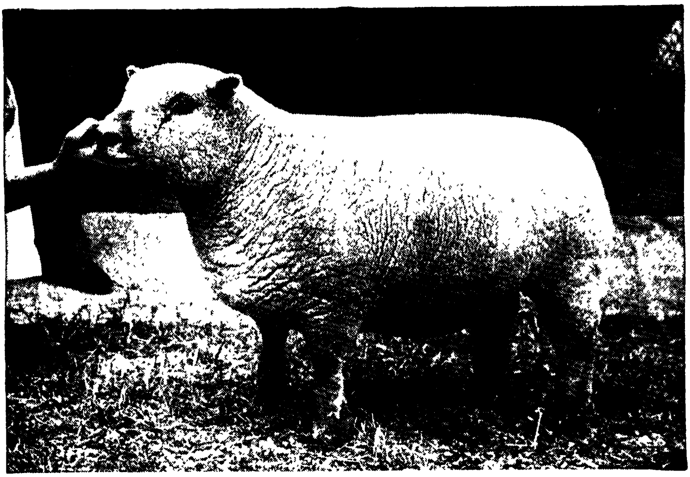

FIG. 59.—Champion Southdown ewe, Illinois State Fair, 1941. (*Photograph by Abernathy.*)

down rams, then used for the production of the highest quality market lambs. Because ewes generally produce only one lamb, which is rather slow to reach a market weight, and because the ewes shear a light fleece, Southdowns have not attracted very great favor with sheep raisers of the Corn Belt. Southdown rams are used rather extensively as sires of market lambs in the Southern states for the production of quality lambs for the lamb trade of the large Eastern cities. Could their size be increased, the percentage lamb crop increased, and the weight of fleece increased without loss of the nearly perfect mutton form, fine bone, and fleece quality, the breed would quickly become the most popular of all mutton breeds.

The Dorset.—The Dorset is a large breed of mutton type, native to England. It is characterized by medium to large size, a long coarse fleece, and white face and leg color. Both rams and ewes produce horns. The Dorset ewes possess the characteristic of mating at any season of the year. Ewes of all other breeds of sheep common to the United States mate only during the fall and early winter months. Most ewes carrying 50 per cent or more of Dorset breeding have the mating characteristic of the Dorset breed. This characteristic gives the Dorset or high-grade Dorset ewe the ability to produce out-of-season lambs or lambs

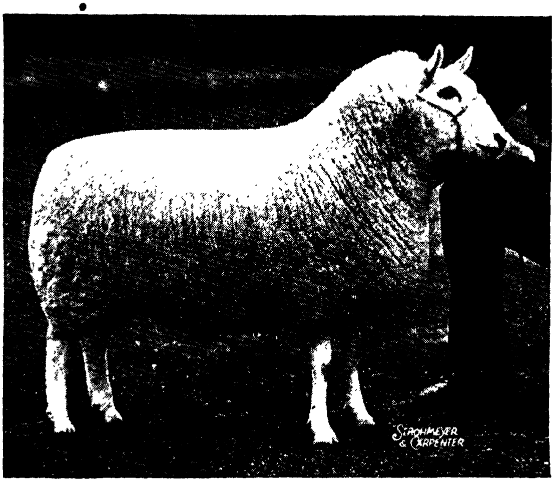

FIG. 60.—A prize-winning Cheviot ewe. (*Photograph by Strohmeyer and Carpenter.*)

that can be made ready for market at times of the year when "genuine spring lamb" is not available from other breeds. This characteristic has attracted a few men to select this breed to produce "Easter" or "genuine spring lambs" to be marketed during the spring months before the lambs from other breeds can be made ready for market. The office of the secretary of the registry association is at Hickory, Pa.

The Cheviot.—The Cheviot is a breed of small, mutton-type sheep covered with a close-surface fleece of medium length and quality. The fleece ends abruptly just back of the ears. The head is small, the ears carried alert, and the face and leg color is white. These characteristics, together with a quick-moving,

alert disposition, give sheep of this breed a very attractive, stylish appearance. The breed is native to the Cheviot hills of southern Scotland and northern England. A few Cheviots have been imported to the United States. Purebred flocks are to be found scattered through the mutton-type producing areas, but the breed has not been extensively used in either grading up or crossing for improvement purposes. The office of the secretary of the registry association is at Oneonta, N.Y.

The Suffolk.—This breed, of English origin, seems to combine to some extent the body-form and flesh-quality characteristic of the Southdown, the fleece character of the Shropshire, the black face and leg coloring and large head and ears of the Hampshire, and the disposition of the Cheviot. It has met with great est favor for crossing with fine-wooled range ewes for the production of market lambs. There are few purebred flocks in the country, and the use of rams of the breed for crossing on Range flocks is limited. The office of the secretary of the registry association is at the Record Building, Union Stock Yards, Chicago, Ill.

The Oxford.—The native home of the Oxford sheep is Oxford County, England. It is a breed of large sheep with a long, coarse fleece. The breed was produced by the crossing of Hampshires and Cotswolds. Sheep of this breed resemble the Hampshire rather than any other breed. The face and leg color is a grayish brown. The breed has met with some favor in the American Corn Belt, where its large size, mutton form, heavy-shearing fleece, high production of twin lambs, and rapid growth appeal to the producer of market lambs. There are few purebred flocks, and the breed has not proved particularly popular for grading up or crossing. The office of the secretary of the registry association is at Clayton, Ind.

The Long-wooled Breeds.—The Cotswold, Lincoln, and Leicester are three breeds of sheep of British origin, characterized by large size, and a long, loose, open fleece, inclined to curl in ringlets at the surface. In the Leicester the ringlets extend to the skin. Sheep of the long-wooled breeds are essentially of mutton type in their form. They were developed and improved for mutton production. Because the fleece differs in its characteristics from the fleece of nearly all other mutton-type breeds and from the fleece of the fine-wooled breeds, the long-wooled

breeds are sometimes considered as representing a third sheep type. In considering them as a type, it should be kept in mind that the only characteristic in which they differ materially from the standard for mutton sheep is in the character of their wool. It is a coarse wool, long and strong in fiber, soft, possessing a high luster. It is especially suited to the manufacture of high-quality plush cloth. Sheep of the three breeds have short white hair on the face, ears, and legs and clean-cut, hard, flinty bone in the head and legs. The ewes produce a high percentage of twin lambs and nurse them well.

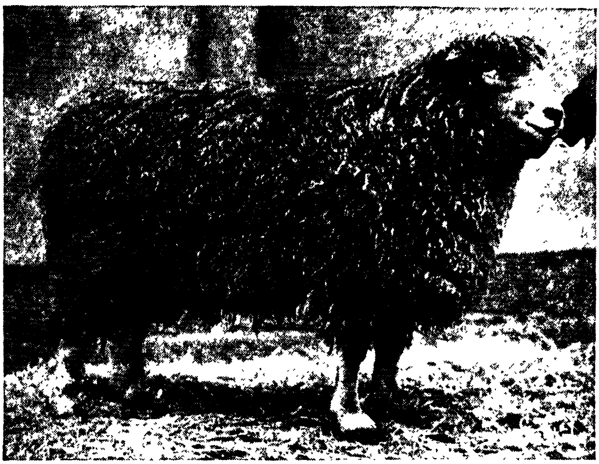

FIG. 61.—Champion Cotswold ram, International Livestock Exposition, 1936. (*Photograph by Cook and Gormley.*)

Representative animals of each of the breeds have been imported to the United States, and each is bred pure to a limited extent in this country. Registry associations have been formed for each breed. The office of the secretary of the Cotswold Association is at the Record Building, Union Stock Yards, Chicago, Ill., of the Lincoln Association, at Marlette, Mich., and of the Leicester Association, at Cameron, Ill.

The long-wooled breeds have not attracted a great deal of interest in the United States for use in mutton production. When bred as purebreds or when the sires were used for grading up or crossing for mutton-lamb production, they were not popular. This was probably because the lambs did not carry a thick enough covering of natural flesh and because their open

fleece made them subject to colds and troubles resulting from exposure to rain and snow. Each of the breeds has been extensively used in crossing with fine-wooled breeds to produce sheep adapted to the Range areas.

Lincoln and Cotswold rams have been used as sires in Range flocks for many years. Usually the practice was to produce one generation of crossbred long-wooled × fine-wooled lambs, then keep the ewe lambs as flock ewes, and mate them back to fine-wooled rams. The crossbred long-wooled fine-wooled ewe lamb is a favorite with many sheep ranchers as a flock ewe. By

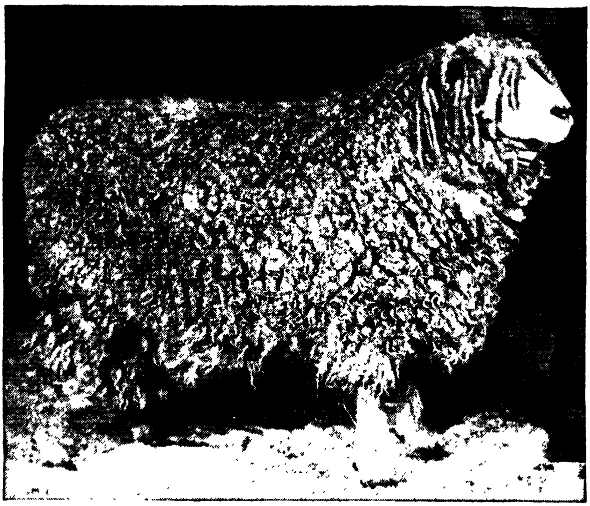

FIG. 62.—Champion Lincoln ram, International Livestock Exposition, 1939. (*Photograph by Cook and Gormley.*)

crossing of the two types, then mating within the crossbreds, there have been produced several new strains of sheep, two of which give promise of becoming important new breeds, the Corriedale and the Columbia.

The Corriedale and Columbia.—The Corriedale is a breed of sheep originated in New Zealand by the crossing of fine-wooled with long-wooled breeds. The Columbia was produced in the United States by a similar crossing of long wools with the Rambouillet. The objective in both instances was the development of a type of sheep that would be more useful in Range production. In each case the first cross sheep proved highly satisfactory. Later progress toward establishing new pure breeds by the

mating together of the crossbreds met with some success. Many of the lambs produced had to be discarded as breeding stock because they did not measure up to the desired standard in appearance or in production. A number of importations of Corriedales have been made to the United States from New Zealand. Two registry associations have been formed: the National Corriedale Sheep Association, with the office of the secretary at the Record Building, Union Stock Yards, Chicago,

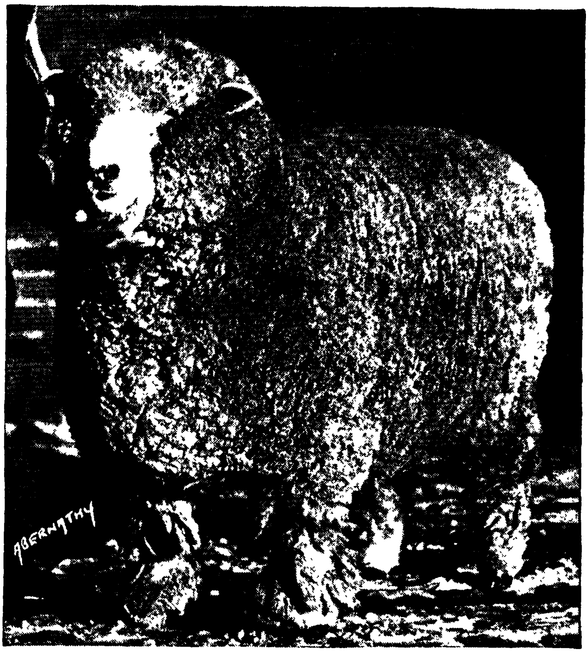

FIG. 63.—Champion Corriedale ewe, International Livestock Exposition, 1940. (*Photograph by Abernathy.*)

Ill., and the American Corriedale Association, with the office of the secretary at Laramie, Wyo.

The first crossing of breeds in New Zealand from which the Corriedale originated was made about 1880. The first crossing from which the Columbia has been developed in the United States was made in 1912. The Columbia is gaining rapidly in popular favor in the Northwest Range states. Very few purebreds of this breed are available. Purebred sires of both the Corriedale and Columbia breeds are in demand for crossing

on purebred or high-grade Rambouillet ewes. The crossbred ewe lambs are retained for breeding stock and the crossbred rams are used as sires in Range ewe flocks to produce market lambs. The office of the secretary of the Columbia Registry Association is in Bozeman, Mont.

FIG. 64.

FIG. 64A.

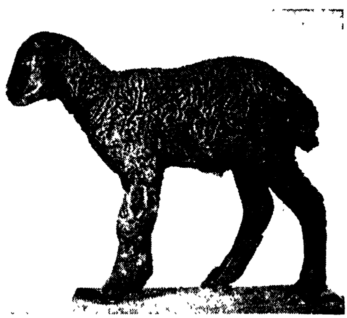

FIG. 64B.

FIGS. 64, 64A, & 64B.—A typical Karakul ewe and lambs. (*Courtesy of I. S. Jones, Friendship, Wis.*)

The Karakul.—Originating in the country of Bokhara, in south central Asia, the Karakul is a product of natural selection rather than selection toward a standard type. Mature Karakuls are medium in size and poor in mutton form and produce a long fleece of coarse fiber resembling hair rather than wool. The fleece varies from gray to dark brown in color. The face and legs are bare of wool and are covered with short, grayish, brown or black hair. The rams have horns, the ewes do not. One

peculiar characteristic is a tendency in mature sheep to develop a large deposit of fat in the rump and about the tailhead. It is said that this characteristic is the result of the irregular supply of feed in the native home of the Karakul. The fat deposit is developed during periods of good grazing following rains and is drawn upon by the sheep for its own maintenance during long drought periods.

The product of the sheep of Bokhara that attracted attention to them and brought about their introduction to the United States is the characteristic fleece of the lambs at time of birth. It is jet black, has high luster, and has curls in tight ringlets close to the skin. The lambs are slaughtered at one to two days old and the pelts used to produce Persian-lamb furs.[1]

Most of the Karakul sheep produced in the United States have been sold to start new flocks. A few breeders have slaughtered some lambs from which the pelts have been processed into fur. It has been found that some strains produce good fur pelts whereas others do not. As yet, satisfactory pelts have not been produced by crossing the Karakul with either mutton or fine-wooled breeds. Two registry associations have been formed: the Karakul Fur Sheep Registry with the office of the secretary at Friendship, Wis., and the United Karakul Registry, with the office of the secretary at Twin Falls, Idaho.

SHEEP-BREEDING METHODS

In general, the breeding of sheep for improvement has been carried on in much the same manner as the breeding of cattle and hogs. The formation of pure breeds was followed by improvement within the breeds, through selection toward definite standards. Some inbreeding has been practiced. A number of breeds were developed by crossing two or more strains or in later years by crossing two or more recognized breeds. The common stock in most countries has been improved by the practice of grading up with purebred rams.

Grading Up.—Improvement of the common stock by grading up with purebred rams has been extensively followed with sheep of the mutton type, wherever they are grown. The same is true of the fine-wooled type, but in fine-wooled breeding, under

[1] POTTS, C. G., Karakul Sheep, *U.S. Dept. Agr. Farmers' Bul.* 1632, 1930, p. 6.

Range production, there has been more of a tendency to practice crossing of breeds.

Crossbreeding.—The existence of the two types, mutton and fine-wooled, the development of many pure breeds, and the changing emphasis from wool to meat are the factors responsible for the extensive crossbreeding of sheep. Starting with ewes largely of high-grade Merino breeding, many Range breeders first crossed them with rams of the Rambouillet breed. This cross was often followed by a cross with a long-wooled ram and then back to a cross with a Rambouillet ram. Ewes from any of these crosses make good Range-breeding ewes. In some instances the long-wooled × fine-wooled crossbred ewes or the fine-wooled × long-wooled × Rambouillet crossbred ewes are mated to a Hampshire or a Suffolk ram. This cross produces a rapid-growing thick-fleshed lamb. When it is used, all the lambs are marketed as feeder or slaughter lambs, since the rancher does not care to keep ewes carrying "black-faced" breeding as flock ewes. Many flocks in the Corn Belt and in other parts of the country have been started with Range-raised ewes carrying principally fine-wooled breeding. These flocks have then generally been graded up by continued use of rams of one of the mutton breeds. Shropshire, Hampshire, Oxford, and Southdown rams have all been used for this purpose. In the Corn Belt the Shropshire has been most extensively used, whereas in the Southern states the Southdown has been most popular. The Hampshire ram is rapidly growing in popular favor for use in siring market lambs throughout the country.

Breeding Purebreds.—The pure breeds of sheep hold fully as important a position in the improvement of the common stock as do the pure breeds of any other kind of livestock. This is one kind of livestock for which there should be more purebred breeders. There have never been enough purebred sires to supply the number of sires needed. As a result, many grade and crossbred sires have to be used each year by producers of market lambs. Improvement in purebred sheep has been accomplished largely by selection based on observation, though in some flocks some mating of related animals has been practiced.

BREEDING GOATS

Breeding Angoras.—The Angora goat takes its name from its native home, the province of Angora, in Turkey. It is thought

that the fleece of the Angora was used in the manufacture of cloth as long as 4,000 years ago. Early pure Angoras were described as goats of small size, with silky white fleece that hung in ringlets. The typical fleece of 12 months' growth sheared 4 to 5 lb. During the eighteenth and nineteenth centuries there developed in many countries an increasing demand for mohair from Turkey for manufacture into cloth. In an effort to meet this demand the goat raisers of Turkey crossed Angora bucks with common goats to increase more rapidly the number of fleece-bearing animals. This resulted in a reduction in quality of fleece and almost obliterated the original pure Angora stock. It did result in larger, hardier goats better suited to meat production.

During the seventeenth and eighteenth centuries many European countries attempted to establish Angora-goat production by importing foundation stock from Turkey. None of them was successful. The Angora goats did not thrive in the climates of the European countries. Angoras were first imported to South Africa in 1838. From a small beginning of one doe and one buck, a large Angora-goat industry has developed in South Africa. Many importations of large numbers of goats were later made from Turkey to South Africa. There are now about 1,500,000 Angoras, purebred and grade, in South Africa, 3,000,000 in Turkey, and 3,000,000 in the United States. The three countries are the leading Angora-producing countries of the world.

The first Angora goats were imported from Turkey to the United States in 1849 by James B. Davis of Columbia, S.C. Many later importations have been made. The dry climate and soil of the Southwest is an ideal habitat for the Angora. This type of goat is highly susceptible to lung diseases, and this climate is favorable to the maintenance of health, especially from the standpoint of lung troubles.

The number of Angoras in the United States has been steadily increasing because of production of purebred stock from the earlier importations, frequent additional importations, and the mating of pure Angora bucks to common short-haired goat stock, then grading up by the continued use of purebred Angora bucks.

Registry Associations.—The American Angora Goat Breeders' Association initiated the registering of purebred Angoras in

1900. A second association, the National Angora Record Association, was organized in Texas in 1918. In 1924 this association merged with the American Angora Goat Breeders' Association, and this is now the only association registering purebred Angora goats. The office of the secretary is at Rock Springs, Tex.

Angora Type.—Mature Angora bucks should weigh 140 to 175 lb.; does, from 90 to 125 lb. Both have horns. In form they are rather narrow-bodied and angular. A weak constitution is a common fault. Careful attention should be given to strength of constitution and health in selecting breeding stock. Fleeces

FIG. 65.—Yearling Angora billies, twelve-months fleece. (*Courtesy of Texas Agricultural Experiment Station.*)

are of three types, described as the tight ringlet lock, the flat lock, and the fluffy fleece. All are acceptable. The tight lock produces the mohair of finest quality fiber, whereas the fluffy fleece shears the heaviest. A fleece of 4 to 5 lb. is considered typical, though the best fleeces from the best purebreds shear as high as 8 to 10 lb.[1]

Breeding Milk Goats.—Milk goats are common in Europe and in many other parts of the world. For many years there has existed in the United States, principally in the Southwest, a type of short-haired goat called the "common" or "American" goat. The origin or source of this type is unknown. The does produce so little milk that it is not profitable to milk them.

[1] WILLINGMYRE, GEORGE T., *et al.:* The Angora Goat and Mohair Industry, *U.S. Dept. Com. Misc. Cir.* 50, 1929, pp. 9–22.

By mating the common does to bucks of the heavy-milking, imported breeds, then following the grading-up method of breeding, many grade does have been produced that compare favorably in milk production to purebred does of the imported breeds.

Of the imported breeds, the Saanen, from the Saanen Valley, the Toggenburg, from the Toggenburg Valley, and the Schwartzenberg-Guggisberger, from the Simmen Valley of Switzerland, are the leading breeds in numbers. The Nubian, from the northern part of Egypt, and the Maltese, from the island of Malta, are represented. Most of the purebred goats of the milk breeds were first introduced by importations from their native homes around the year 1900.

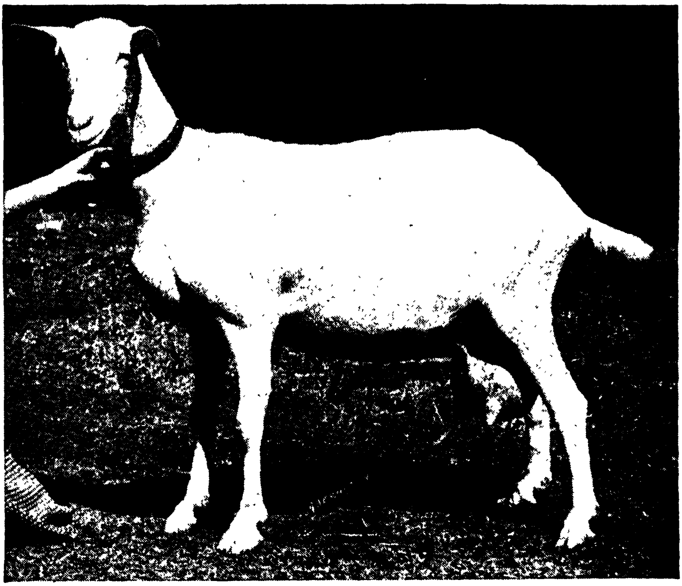

FIG. 66.—The Saanen doe, Columbine Marthas Ann, Champion at many exhibitions. (*Courtesy of Mrs. Theo. Moeller, Springfield, Ill.*)

Registry Associations.—All purebred milk goats except the Nubian are registered by the American Milch Goat Record Association, organized in 1903. The office of the secretary is at Vincennes, Ind.

Nubians are registered by the International Nubian Breeders' Association organized in 1916. The office of the secretary is at La Jolla, Calif.

Milk-Goat Type.—Each of the pure breeds of milk goats possesses distinguishing characteristics, but the important qualifications are the same for all of them. Does must be of an angular type, free from excessive thickness of form, and must have well-developed mammary systems. Colors vary even within the breeds. Bucks and does of all the milk breeds are without horns, though horns may occasionally occur on either. Both bucks and does of the common or American goat have horns.

Production of 3 to 5 lb. of milk per day through a lactation period of 7 to 8 months is considered satisfactory and profitable production, though records of 10 lb. of milk per day for a 10-month lactation period are considered attainable.[1]

Questions

1. Explain the trend of improvement in sheep through breeding and how it has been secured.

2. Which of the pure breeds was first imported to the United States?

3. Explain the circumstances surrounding the early extensive importation of sheep.

4. What characteristics would distinguish a Merino sheep from a Rambouillet?

5. Name the breeds of sheep of mutton type, representatives of which have been imported to the United States.

6. State the distinguishing characteristics of the Shropshire breed.

7. State the distinguishing characteristics of the Hampshire breed.

8. State the distinguishing characteristics of the Southdown breed.

9. Name the breeds characterized as long-wooled breeds, and give their distinguishing characteristics.

10. Name two characteristics of the Dorset that distinguish it from all other breeds common to the United States.

11. Explain the origin of the Corriedale and Columbia breeds.

12. What would be the appearance of an ideal sheep of either of these breeds?

13. How do you explain the extensive use that has been made of crossbreeding in sheep production?

14. How do opportunities in the breeding of purebred sheep compare with similar opportunities in breeding other kinds of livestock?

15. Why has it not been desirable to cross Karakul sheep on other breeds?

16. Give the place of origin, date of first importation, and methods followed in breeding Angora goats in the United States.

17. Name the breeds of milk goats that have been imported to America, and give the native home of each.

[1] SHAW, EDWARD L., Milk Goats, *U.S. Dept. Agr. Farmers' Bul.* 920, pp 7–19, 1927.

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The Sheepman, Lexington, Ky.
Sheep Breeder, Union Stock Yards, Chicago, Ill.
The Southwestern Sheep and Goat Raiser, San Angelo, Tex.

CHAPTER XXVII

FEEDING SHEEP

In promoting sheep production, various agencies have frequently advanced the argument that the sheep is the most economical of all farm animals in its feed requirement. It is true that the sheep has a record of a trifle more efficient utilization of feed than beef cattle. It is also true that sheep will eat a somewhat wider variety of plant growth, especially in the green stage, than will cattle. Contrasting the total feed requirement for the production of 100 lb. of beef with the feed requirement for the production of 100 lb. of lamb, it is found that a trifle higher proportion of roughage to grain is utilized in feeding sheep and lambs than in feeding beef cattle. These characteristics of sheep have led to the application of the term "scavengers" to indicate their ability to subsist on cheap feed. The elaborate claims made for the ability of sheep to subsist on poor pasture and cheap feed have probably done the industry more harm than good, because they have caused many beginning sheep growers to underestimate the minimum feed requirement for profitable production and to fail in sheep raising through neglect of proper feeding and care.

Grass—the Sheep Feed par Excellence.—Although the sheep differs markedly from cattle in habits and size, it has the same type of digestive system and utilizes the same kinds of feed. Grass is therefore the most important feed for sheep, just as it is for cattle, and for the same reasons. Sheep have several advantages over cattle in the grazing of poor, natural nontillable grazing lands. They can graze more closely than cattle and will do well on semiarid lands where the growth of grass is too short or too thin to support cattle. They can graze successfully on mountainsides that are too steep and too rough for cattle. They will eat many weeds and the leaves of bushes that cattle will not eat and for this reason are better adapted to grazing forests and wooded land. Sheep also seem better adapted than cattle to the successful grazing of a number of annual plants. These

advantages, together with the ability of sheep to utilize all good natural and cultivated permanent pastures fully as well as cattle, give them a wide adaptability so far as subsistence by grazing is concerned. In providing pastures, in pasture management, and in controlling grazing, the same recommendations that were made for cattle apply to sheep. In supplementing permanent pastures for sheep through the hot, dry months of July and August, Sudan grass, sweet clover, and rape are the three crops most commonly used.

Most farmers know the approximate acreage of pasture required per mature cow under conditions prevailing on their farms. The same acreage that will support one average beef cow and her calf through the grazing season will support from five to seven ewes and their lambs, depending on whether the type of sheep being maintained is of large or small size.

Because permanent pastures that are grazed continuously by sheep generally become infested with the eggs of the stomach worm, it is necessary to practice alternate or rotation grazing if this troublesome parasite is to be held under control. Where possible, sheep should be shifted to an entirely new pasture that has not been grazed the preceding year. Where this procedure is not practical, alternate grazing with rest intervals of two weeks given each pasture should be followed.

Winter Feeding of the Ewe Flock.—Under Range production, the ewe flock is maintained by grazing through the longest possible season. On most ranches, some grazing is done every day in the year except those days on which the grazing areas are covered with snow. This reduces the supply of feed that must be provided for the winter maintenance of the ewe flock to a comparatively small amount, especially through the great sheep-ranching area of the Southwest. In the Northwest, native prairie hay is the principal feed provided for the winter feeding of the ewe flocks. The native hay is often supplemented by the feeding of about $\frac{1}{5}$ or $\frac{1}{4}$ lb. of cottonseed or linseed cake per ewe per day during that part of the winter when grazing is not possible. More recently many Western ranchers have been providing alfalfa hay on their own ranches by growing it under irrigation, or, where this is not possible, alfalfa is purchased and trucked to the ranches from the nearest available source of supply. Alfalfa hay is a particularly highly valued hay by sheepmen.

Sheep relish it and do better on it than on any nonlegume type of roughage.

In the Corn Belt and in the Eastern and Northern states, the ewe flock must be maintained on dry feed throughout the winter season. The winter-feeding period begins sometime in November and must be continued until sometime during April or early May, when the spring growth of grass becomes tall enough and suitable to pasture. For the winter feeding period, a legume hay should provide the major part of the ration. It may be alfalfa, clover, sweet clover, or soybean hay. The amount of legume hay may be satisfactorily and often economically reduced by feeding it only once a day and feeding some such nonlegume roughage as prairie hay, corn fodder, corn silage, millet hay, or oats straw as the other feed. Ewes that begin the winter period in thin flesh or ewes that are five years old or more should be fed from ½ to 1 lb. of grain per head per day, beginning not later than Feb. 1 and continuing until they can be turned to good pasture. This means that a normal feed requirement for the average ewe for the winter feeding period in the Corn Belt and in the Northern and Eastern states is about 500 lb. of legume roughage and 75 lb. of grain, or 300 lb. of legume roughage plus 300 lb. of nonlegume roughage and 75 lb. of grain.

Feeding Young Lambs.—Just as with the feeding of young beef calves, the feeding of young lambs varies widely according to the plan of production being followed.

Feeding the Young Lamb in Range Production.—Except in rare instances, the only feed the Range-raised lamb ever tastes from the time he is born until the time he is marketed is the milk of his mother and grass. It is the common practice to allow the Range lamb to nurse until about the close of the grazing season, when he is weaned and marketed immediately following weaning. At this time the Range lamb generally goes to market as a feeder lamb at a weight somewhere between 55 and 70 lb. He is usually moderately thin in flesh but healthy and ready to be taken to a feed lot to be put on a fattening ration and made ready for slaughter as a fat lamb after putting on a gain of about 30 lb. through a feeding period of about 90 days.

Feeding the Young Lamb in Farm Flocks.—In raising lambs in the smaller farm flocks, such as are generally maintained on

Corn Belt and on the Eastern and Northern farms, the lambs are commonly born during the months of February, March, and April. This means that the lamb will be from one to three months old before he and his mother can go to pasture. Under this production plan, it is profitable to provide a creep that is kept supplied with a trough of grain and a manger of high-quality legume hay, to which the young lamb can go and eat at will. This creep feeding should be continued until the ewe and lamb go on to good pasture, when it may as well be stopped.

If they are sired by good thick rams of the larger mutton breeds, lambs born in February and March may be weaned in June or July, when a part of the crop, particularly the single lambs, will be ready for market as fat lambs weighing 80 to 90 lb. There will be a part of the crop, even though the total number is small, that will not be large enough or fat enough to sell as slaughter lambs and that, if sent to market along with the others, will sell as feeders. There is no easier way of making money on a farm than by holding these feeder lambs back, weaning them, putting them on a fattening ration in a dry lot, and keeping them there until they are fat enough for slaughter. This will require a 40- to 60-day feeding period and about 75 lb. of grain and 75 lb. of hay. The fat lamb will then sell for double the money he would have brought going to market with the others and selling as a feeder.[1]

Lambs born later or lambs sired by rams of the smaller mutton breeds will not be ready to be weaned or marketed so early in the summer but should be managed in much the same way and marketed whenever they do get ready. It is desirable to get lambs from farm flocks on the market as early in the summer as possible, because the price is usually about $1 per hundred higher in June and July than it is in August and September. On the other hand, there will be little benefit derived from the early marketing if the lambs do not qualify as top slaughter lambs.

Flushing the Ewe Flock.—For many years, it has been the opinion of many flock owners that a larger percentage lamb crop would be secured if the ewes were fed liberally for a period of 2 to 3 weeks just preceding the mating season, so that they would be in a thrifty, gaining condition during this period.

[1] Mimeograph Report, Minnesota Agricultural Experiment Station, St. Paul, Minn., 1940.

Flushing is accomplished by turning the ewes onto a fresh, rich pasture growth or by feeding a rather liberal allowance of grain and good-quality hay. In an experiment conducted by Clark[1] at the Minnesota Agricultural Experiment Station, results led to the conclusion that if the ewe flock was in thin or unthrifty condition at the beginning of the breeding season, the percentage lamb crop could be increased appreciably by flushing but that if the flock was already in good thrifty condition, no increase in the number of lambs produced was secured by flushing the ewes and making them still fatter.

Feeding the Flock Ram.—The care and feeding of the flock sire are of importance in sheep production, because low potency seems more common among rams than among sires in other kinds of livestock. There are causes other than improper feeding that result in failure of rams to breed successfully, but it is thought that improper feeding is a frequent cause. The season of advantageous mating of sheep is short. In other words, it is desirable to have a crop of lambs born within a short period of time so that they will be uniform in age and size throughout their growing period. To accomplish this result, flock sires must be healthy, vigorous, and produce strong sperm cells through the mating season. One of the essential procedures to ensure that a ram be in such condition is that he be well fed for some weeks before the beginning of the breeding season and that he be kept well exercised. Mating is accomplished most successfully when the flock sire is allowed to run with the ewe flock at night and is kept away from the flock during the day. Handled in this way, the ram can be fed hay and a grain ration during the day to supplement the grazing at night. A grain mixture of 30 per cent corn or barley, 30 per cent oats, 30 per cent bran, and 10 per cent linseed, soybean, or cottonseed meal, fed at the rate of 2 to 3 lb. per head per day, provides a highly suitable grain allowance for the sire during the mating season. Good-quality legume hay should be supplied.

Feeding Fattening Lambs.—In many sheep-growing areas, lambs can and should be made large enough and fat enough for slaughter off grass. The grass-fat lamb has an advantage over the grass-fat steer or heifer in that he meets with a more favorable

[1] Clark, R. T., "Studies of the Physiology of Reproduction in Sheep," graduate thesis, University of Minnesota, p. 3, 1933.

reception on the market and is not discounted below top price for grain-fed lambs, as is the grass-fat steer or heifer. Everywhere sheep growers are trying so to plan their lambing season and flock management that the highest possible percentage of the lambs can be made ready for slaughter off grass. Gains from grass are nearly always made at lower cost than gains from dry-lot grain feeding.

Under ranch production not many lambs get large enough or fat enough for slaughter by the close of the grazing season. It is therefore necessary that the great bulk of Range-raised lambs be fattened on dry feed through a 60- to 100-day feeding period to put on the necessary weight and finish. Every year there is also a percentage amounting to at least 30 per cent of all lambs produced in other than Range areas that find their way to market in feeder rather than finished condition. The largest number of such lambs are purchased by farmers in the Corn Belt states, where they are fed largely on corn and alfalfa, clover or soybean hay. Lambs will fatten successfully on a ration of corn, a legume hay, salt, and water. They will eat about 1½ lb. of corn and 1½ lb. of legume hay per lamb per day and put on a gain of 0.30 to 0.35 lb. per day. The average feeder lamb weighs 60 to 65 lb. and should weigh 90 to 95 lb. when sent to market. A gain of 30 lb. is a normal gain. A good lamb feeder will put a 30-lb. gain on a group of lambs in about 90 days and will feed a total of about 140 lb. of corn and 140 lb. of hay per lamb.

Many concentrate feeds other than corn are fed to fattening lambs. All the small grains make good concentrates for fattening lambs. Such feeds as elevator or mill screenings, dried beet pulp, beet or cane molasses, sorghum seed, and millet seed are extensively used. Because most of these feeds are higher in fiber and more bulky than corn, it is advisable to feed a high protein concentrate along with them, especially if a nonlegume roughage is fed. From ⅕ to ¼ lb. per lamb per day of a protein concentrate running around 40 per cent protein content is about the right amount. If a legume roughage is used, 0.15 lb. of protein concentrate is enough.

During recent years many lambs have been successfully fattened in the beet-growing areas. Wet or dry beet pulp and beet molasses comprise the concentrate under this feeding plan and

beet tops and alfalfa hay, the roughage. When wet beet pulp is fed, the alfalfa hay is cut and the beet molasses mixed with it. When dry beet pulp is fed, molasses is mixed with the dry pulp.

Factors Affecting Profits from Lamb Fattening.—The same factors that affect profits from cattle fattening influence profits from lamb fattening. They are (1) the price margin secured, (2) the feed cost per 100 lb. gain, (3) the costs other than feed, and (4) the death loss.

Margin and feed costs were the two factors emphasized as most influential in determining profits from cattle fattening. In the fattening of lambs, death loss is a factor of much greater significance than it is in cattle fattening. Seldom is a group of feeder lambs fattened without some death loss during the fattening period. Experienced feeders will say that a death loss of 4 per cent of the lambs is about what may be expected. This is a little high, and many feeders succeed in keeping the death loss as low as 1 to 2 per cent. Lambs that die in the feed lot generally succumb to pneumonia or die from overeating. Death from both causes can be kept at a minimum by providing suitable shelter and care and by feeding a ration light and bulky enough so that it will not overtax the digestive system of the lamb. Because lambs eat a higher proportion of roughage to grain than do cattle, the problem of keeping the feed cost low is not quite so difficult with fattening lambs as it is with fattening cattle. A margin is necessary to ensure a profit, but many lamb feeders will have a fairly satisfactory profit on a margin of $1 per 100 lb. at the feed lot.

Questions

1. What are the principal differences between the feed requirements of sheep and beef cattle?
2. How is the ewe flock fed under Range production?
3. How is the lamb fed under Range production?
4. How is the ewe flock fed under mixed-farming production?
5. How should the lamb be fed under mixed-farming production?
6. What is meant by flushing the ewe flock, and what is the object?
7. How should the flock ram be fed?
8. What is the weight of a typical feeder lamb?
9. Explain a good method of feeding fattening lambs.
10. How much should a fattening lamb gain in weight per day?

11. What is the average daily feed requirement of a fattening lamb?
12. Explain the important factors that affect profits from lamb fattening.

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CHAPTER XXVIII

THE MANAGEMENT AND CARE OF SHEEP

From 65 to 75 per cent of the total lamb production of the United States is accomplished by a two-phase procedure. The first phase is the raising of the lambs to the feeder age and weight, carried out mainly on the Range lands of the South and West. The second is the fattening of the Range-raised lambs in the Corn Belt and other regions where feeds suited to fattening are available. Next in importance as a management plan is the maintenance of the farm ewe flock for market-lamb production, this being the plan followed when a flock of ewes is maintained in an area where feeds suited to fattening the lambs are available on the same farm on which the lambs are raised, so that the complete process of raising and fattening can be carried out on the same farm. The breeding of purebred sheep to be sold for use as breeding stock is a specialized management plan offering an opportunity to increase the profit on each sheep raised. The sheep industry, therefore, offers the following four management plans: (1) producing feeder lambs (sheep ranching), (2) producing market lambs (the farm flock), (3) fattening lambs, and (4) breeding purebred sheep.

Producing Feeder Lambs or Sheep Ranching.—To be a worthwhile enterprise, the production of feeder lambs must be conducted on a sizeable scale, with the use of a considerable number of ewes. This is because the annual gross income per ewe is small. Since feeder lamb production is carried on principally in areas suited mainly to sheep production, the income from the sheep is the major income from the farm or ranch on which it is conducted. To provide a family living on such a ranch, a minimum flock from which the owner can secure his existence would be about 300 ewes. There are many Range flocks numbering from the minimum of 300 up to about 1,500 ewes. A 1,500-ewe flock is considered still a modest-sized enterprise in sheep ranching, and there are many Range flocks numbering many more ewes than 1,500.

Regardless of the size of the flock, feeder lamb production is carried on under much the same management plan wherever sheep ranching is practiced. Capital investment in land and sheep is large in proportion to gross income. The equipment and labor requirements are low. Sheep ranching, like cattle ranching, offers an opportunity to invest capital rather than to utilize labor. Whenever possible, sheep ranchers supplement grazing lands owned by themselves with lands leased from the forest reserves, Indian reservations, and other state and federally owned lands. Under the ranch-management plan, the ewe

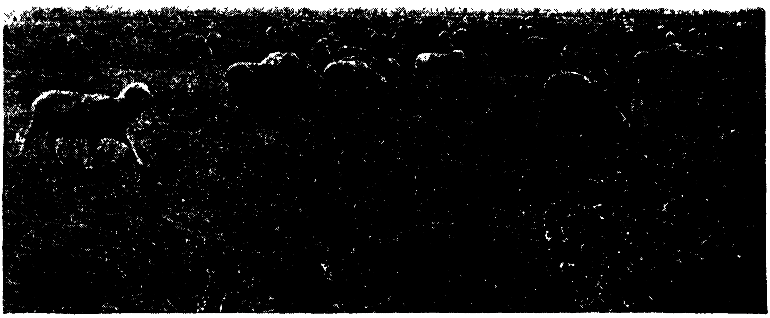

FIG. 67.—Range ewes grazing a typical Northwest level, or prairie type range. (*Courtesy of Northern Pacific Railway.*)

flock is herded throughout the grazing season. Building equipment required amounts only to sheds for winter shelter and lambing and enough fencing about the buildings to keep the flock confined during winter months. A flock ranging from 1,000 to 2,500 ewes may be assigned to one shepherd for the lambing and grazing season. The herders have a team-and-camp wagon in which they live through the season. Important items requiring managerial attention include financing the enterprise, arranging for grazing lands, providing a supply of hay for winter feed, directing the shearing, packing, and marketing of the wool, keeping the camp wagons supplied, directing the grazing, marketing the lambs, supplying sires, and directing the mating of the ewes.

Many new practices are continually being introduced in Range sheep management. Most of them are directed toward the production of a lamb of better mutton form and an effort to market lambs ready for slaughter rather than feeder lambs. Some of the new practices are directed toward increasing the percentage lamb crop, and saving a higher percentage of the lambs born. Some are directed toward increasing the productivity of the Range and a better supply of winter feed. Some of the more important new management practices are (1) providing sheds for winter shelter and lambing in the sheds rather than on the Range, (2) growing alfalfa hay for winter feed, (3) assigning smaller flocks of 1,000 to 1,500 ewes to each herder, rather than 2,500 to 3,000, (4) compelling herders to use one-night bedding-down spots rather than bedding down on the same spot several nights in succession, (5) providing better sires to secure more rapid improvement through breeding, and (6) cooperative effort in marketing wool and lambs to secure better prices. Perhaps in no other phase of meat animal production has progress in better management methods been so rapid during the last 20 years as in Range sheep production.

Market-lamb Production.—The maintenance of a flock of sheep as one of several livestock enterprises is a common management practice on many farms throughout the United States. Such flocks are most numerous in the Corn Belt area. Farm flocks increased rapidly in numbers during the period from 1870 to 1890, during which many sheep of the mutton breeds were imported from Great Britain. The fine-wooled sheep of the earlier days were poorly adapted to utilizing the luxuriant pastures and the corn for which the Corn Belt farmer needed a market. The sheep of the new mutton breeds proved better suited to his conditions. This combined with the increasing demand and higher prices for fat lambs gave sheep raising a great stimulus. Sheep raising in the Corn Belt as well as in many other mixed-farming areas has been increasing rapidly during the last twenty years because of the steadily profitable returns from it.

In the management of the farm flock, dry, well-ventilated sheds, a supply of good roughage for winter, and good pastures for summer constitute the principal requirements for success. Ewes are bred to lamb early in the spring (March and April).

They are maintained almost entirely on roughage through the winter months. Ewes and lambs may be fed a little grain until the grass is ready, but then they go on pasture with no supplemental feed until the lambs are weaned at about five months old. Many of the lambs are ready for market as fat lambs at 80- to 90-lb. weights at weaning time. Some always need to be held back for a short finishing period on grain; otherwise they will sell as feeders. Thus the maintenance of a farm flock is not a means of marketing very much corn, but the Corn Belt farmer has changed his cropping plan some and now grows more pasture

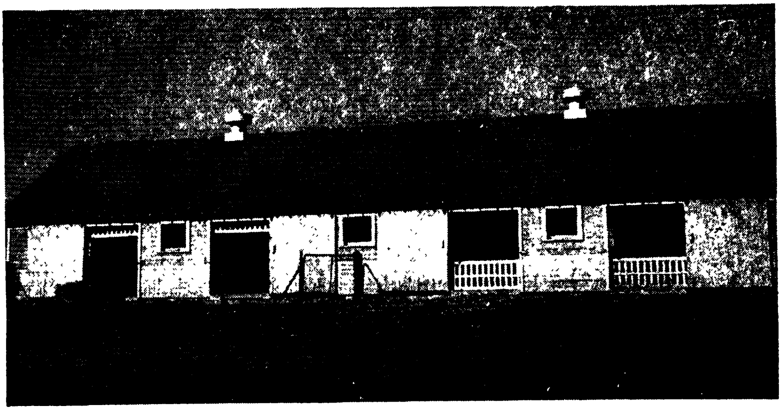

Fig. 68.—A sheep shed at University Farm, St. Paul, Minn. Suitable for housing a farm ewe flock.

and legume hay crops and finds the ewe flock a highly satisfactory method of marketing this type of feed.

Successful management requires judgment in keeping the investment in equipment and breeding stock in line with the probable returns from the enterprise. Management items often needing more thoughtful attention on the part of the farm flock owner include (1) greater care in securing more suitable breeding stock, both ewes and rams; (2) greater care in providing suitable feed and pasture; (3) greater care in keeping the wool in good condition; (4) more thoughtful attention to finishing and marketing the lambs; and (5) more thorough effort to keep the flock free from parasite infestations.

Fattening Lambs.—The specialized sheep- or lamb-fattening enterprise had its beginning as an outgrowth of sheep ranching. In the beginning, older sheep were fattened rather than lambs.

The secret to success in the fattening of the older sheep was the use of very cheap feed. Thousands of ewes and wethers were fattened during the period 1875–1910 by feeding them nothing but prairie hay and elevator and flour-mill screenings. Most of the fattening was done near the large flour-milling centers, where the screenings were obtainable at lowest cost. The development of the use of screenings as filler and a carrier of molasses in prepared feeds and their inclusion with the middlings and bran by the flour mills, beginning about the year 1900, so increased the price of screenings that their use in sheep and

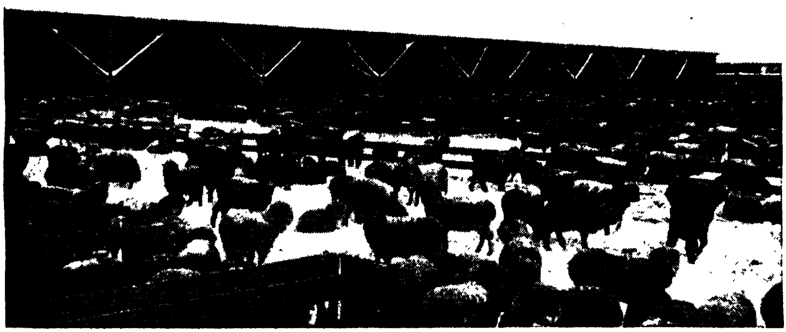

FIG. 69.—A North Dakota lamb-fattening yard. Note large open shed for shelter. (*Courtesy of Northern Pacific Railway.*)

lamb fattening, along with prairie hay, which had also advanced in price, became unprofitable.

The decline in the fattening of older sheep was followed by an increase in the fattening of lambs. The fattening of lambs was developed largely on Corn Belt farms, where the fattening was done by feeding corn and a legume hay. This enterprise has continued profitable throughout its history, and corn and a legume hay, with no additional feed except salt and water, are still the standard Corn Belt lamb-fattening ration. This enterprise is at present a highly favored livestock enterprise on Corn Belt farms. The only factor limiting its expansion is the number of suitable feeder lambs available each year. All Range-raised lambs that are marketed in feeder condition and

all lambs from the farm-flock areas that reach market in feeder condition find eager buyers waiting to secure them.

Lamb fattening has attracted the attention of many farmers in areas outside the Corn Belt, such as the sugar-beet and alfalfa-growing areas of Colorado and western Nebraska, the small grain-growing area of the Red River Valley in western Minnesota and eastern North and South Dakota, and the Michigan area, where screenings are still extensively used.

The fattening of lambs requires little expenditure for shelter, equipment, and fencing. The big problem from the management

FIG. 70.—A well-arranged lamb-fattening yard. No shelter is provided except the board fence. (*Courtesy of Great Northern Railway.*)

standpoint is the securing of the feeder lambs at a cost that will allow a profit. The small feeder wanting a carload or less of feeder lambs can generally buy them to best advantage at a large central market. The large feeder may travel out into the Range area and buy direct from a rancher or through agents, many of whom are always operating in the Range areas during the contracting and marketing season. Many feeder lambs are sold on contract each year during the summer months for delivery at a later date. The date of delivery is set at the time the contract is made. Some lambs are fed "on contract" each year. In this procedure, the rancher or some finance agency holds the investment in the lambs; the feeder receives them, furnishes the feed, cares for them during the fattening period, and receives the portion of the selling value represented by the gain in weight. Since fat lambs generally sell for 1 to 3 cents per pound more than

feeders, the original owner or finance agency benefits by the higher price received for the original weight.

A watchful managerial eye is needed throughout the feeding period to see that any problem in nutrition or health that may appear is given prompt attention. An otherwise successfully managed lamb-fattening enterprise may easily result in loss rather than profit through excessive loss of lambs by death during the feeding period.

Because of the small amount of space required, the small investment in equipment, and the short period of time required to fatten lambs, this enterprise offers an opportunity for speculative endeavor on a large scale. A few men have promoted it in that way, buying the lambs, buying the feed, and hiring the labor to carry on the feeding. In a few instances, large fortunes have been made from it in a short period of time, and in others heavy losses have been experienced. The lamb-fattening enterprise is most favorably located when it is conducted on the average family-sized farm using the lambs to market feeds grown on the farm.

The Management of Purebred Sheep.—As stated earlier in this chapter, there is room for more breeders of purebred sheep. This enterprise is somewhat more highly specialized than any of the other sheep-production enterprises and requires ability on the part of the manager to breed creditable sheep, develop them, and sell them. Successful production requires continuous attention to the details of care. Successful selling requires effective advertising. Purebred sheep are advertised by exhibiting at shows and carrying advertisements in farm papers and specialized sheep publications. Most breeders of purebred sheep prefer to raise two or more breeds, since this cuts down the per head exhibiting costs and increases the sales opportunities. In breeding purebreds, it is advisable to select breeds already well known and popular in the area in which the breeder is located.

Equipment for Sheep.—One of the advantages of sheep production over other classes of livestock is that sheep require simple cheap shelter and equipment, even in cold climates. The fleece protects them from the cold. It is, however, important that sheds be well enough constructed to keep them dry and protected from severe drafts. Getting wet from snow or rain and lying in poorly ventilated sheds or outdoors on wet ground

will result in many cases of pneumonia. The accompanying illustrations show several devices that help to simplify the feeding and care.

The Care of Sheep.—It is the caretaker's responsibility to see that the ewes are mated at the proper season, that they are fed according to their needs, and that they have attention at lambing time. It is his duty to see that as high a percentage of lambs as possible is raised. Some orphan or triplet lambs can often be raised by putting them on other ewes that have single lambs or by raising them on cow's milk. It is the caretaker's duty to dock all lambs when they are a few days old and to

FIG. 71.—A lamb creep is essential for proper feeding of early spring lambs.

castrate ram lambs that are to be raised as wethers before they are a month old. Failure to perform these two operations at an early age always results in loss or trouble later. In purebred production, the accurate keeping of records necessary for registration of the lambs is an essential part of the work. The "fitting" of sheep for exhibition is an art requiring experience and skill on the part of the shepherd in feeding, "blocking," or trimming the surface of the fleece and "posing" or handling the sheep while they are being examined by the judge. Fitting and exhibiting are arts in themselves. In flocks of purebred sheep, when a professional shepherd is employed, he is expected to do the shearing and packing of the wool. In the small farm flock, it is often preferable to employ a professional shearer. Such professional shearers are always available in localities in which a considerable number of sheep are raised. The charge for shearing

varies all the way from 10 to 25 cents per head, depending on circumstances, such as how far the shearer has to travel, how many sheep are to be shorn, whether they are small or large, wrinkled or smooth, and whether board and lodging are furnished. The shearer generally provides his own shearing outfit and power.

Dipping all sheep for the elimination of external parasites and mange mites is necessary. It should be done soon after shearing is completed. Likewise, treatment of all sheep for the elimination of internal parasites is a caretaker's responsibility. The beginning point in the control of internal parasites is the providing of new pasture each spring that was not pastured by sheep the previous season. This may be accompanied by alternate or rotation grazing to advantage. Even then it is advisable that sheep be treated for the elimination of internal parasites. Three to four treatments during each grazing season are necessary to be thoroughly effective.

The Diseases of Sheep.—Fortunately, sheep are comparatively free from the ravages of communicable diseases. They may be affected by all the diseases common to cattle, but such diseases as tuberculosis, Bang's disease, blackleg, anthrax, and foot-and-mouth disease seldom occur and seldom cause serious loss in sheep flocks. They are, however, susceptible to colds and pneumonia, and many lambs die of pneumonia each year. Prevention of colds and pneumonia by good care is the only means of keeping down loss from this cause.

Sheep Parasites.—Although maintenance of health, so far as disease is concerned, causes the caretaker comparatively little worry, the parasite problem fully makes up for this advantage. Sheep parasites are of two kinds, internal and external. The internal parasites include the stomach worm, the tapeworm, the nodular worm, the liver fluke, and the lungworm. The external parasites include the sheep tick, lice, and several forms of mange, sometimes called "sheep scab." Infection of sheep by fly maggots and the larvae of the nose fly are troublesome problems during the fly season.

The Stomach Worm.—The stomach worm is the most damaging of all sheep parasites. It is a small, thin worm, pink to brown in color, about an inch long, which lives in the stomach and small intestines. It lives by sucking blood from the walls of the stomach and intestines. Eggs are deposited in the digestive

system by the female worms, passed out with the feces, and undergo several developmental stages. The larvae are picked up by sheep in the drinking water or on the grass. They then grow to maturity in the digestive system. A heavy infestation of stomach worms is most damaging to young lambs two to four months old. A treatment recommended is the dosing of all sheep in the flock, beginning in June each year and continuing at 4-week intervals through September.

One of the most effective and safest preparations to use is a solution made by dissolving 4 oz. of bluestone (copper sulphate)

FIG. 72.—A convenient arrangement for dosing sheep for the elimination of internal parasites.

crystals in a quart of warm water. Put this in a glass, earthenware, or enamel container, and add water to make 3 gal. This supply will treat about 100 sheep. In localities where tapeworms are troublesome, add 3 oz. of nicotine sulphate (Black Leaf 40) to the 3 gal. of copper sulphate solution. Proper dosage is as follows: lambs up to 40 lb. in weight, ¾ oz.; lambs 40 to 60 lb., 1 oz.; lambs 60 to 80 lb., 2 oz.; yearlings, 3 oz.; mature sheep, 3½ oz. Sheep should be off feed and water for 12 to 18 hr. before dosing and 5 hr. after dosing. Care must be taken to use solution of the right strength and to avoid getting the drench into the lungs.

The Tapeworm.—There are five or six varieties of tapeworms that affect sheep. They live largely in the small intestine but

may be found in any part of the digestive system. They live on the contents of the digestive system. They do most damage by getting into the ducts to the liver and pancreas and clogging them. They sometimes grow to be 1 to 3 ft. in length. There is no sure, safe treatment to eliminate them except pasture rotation. Treatment with nicotine sulphate is thought to be helpful.

The Nodular Worm.—This is a short, thick worm that lives in bunches attached to the walls of the large intestine. There is no satisfactory treatment for it except pasture rotation, though it has recently been demonstrated that the use of phenothiazine as an anthelmintic promises to be a means of eliminating the nodular worm.

The Liver Fluke.—This parasite infests the liver and bile ducts. It is found in low, wet pastures, particularly near the ocean coast lines. There is no highly satisfactory treatment for its elimination except pasture rotation.

The Lungworm.—This is a thread or hairlike worm infesting the lungs, bronchial, and nasal passages. It is highly damaging under heavy infestation. There is no effective treatment except pasture rotation.

Grub in the Head.—This is a fly larva. The egg is deposited on the edge of the nostril by the fly during the summer months. The egg hatches, and the larva works its way up on the nostril, sometimes getting into the cavities of the head. It causes irritation and stoppage of the nostrils. The only prevention is to attempt to keep the noses of the sheep smeared with pine tar through the months of June and July. This will prevent the flies from alighting on the nostrils and depositing their eggs.

Maggots.—Sheep are often attacked externally by fly maggots resulting from the depositing of eggs by certain species of flies. The eggs are deposited in filth collections in the wool of the sheep. The maggots burrow down to the skin and eat their way through the skin and into the muscle tissue.

When discovered, they can be quickly eradicated by soaking the wool over the infested part with gasoline, ether, or chloroform.

The Sheep Tick.—This is the most common of the external parasites of sheep. It is a rather large insect that lives by sucking blood from the skin. It is easily eliminated by dipping following shearing. All sheep on the farm, including the young lambs, must be dipped. There are many effective preparations, any

of which may be used for this purpose. If the flock shows a heavy infestation at shearing time, it should be dipped a second time, 10 days following the first dipping. The second dipping may be eliminated if a preparation known to destroy the eggs as well as the mature ticks is used. Dipping for ticks will eliminate lice also.

Sheep Scab or Mange.—The sheep-scab mite is a very small insect scarcely visible to the eye. It burrows into the skin, causing severe irritation and itching. It develops in colonies, causing the wool to drop off over the affected patches, leaving the skin rough and scablike in appearance. There are several varieties of sheep mange, some more difficult to eradicate than others. Successful treatment requires dipping in a lime sulphur dip made by dissolving 8 lb. of unslaked lime and 24 lb. of flowers of sulphur in 100 gal. of water. Sheep affected with mange should be dipped twice, the second dipping 10 days following the first. Some commercial sheep-dip preparations are effective in eradicating mange.

Questions

1. Name the four principal sheep-management plans.

2. State some of the more important new management practices in sheep ranching.

3. What items in care and management require closest attention in farm-flock management?

4. What type of sheep were fattened in the early history of the specialized sheep-fattening enterprise?

5. What feeds were used?

6. To what conditions is lamb fattening best suited at the present time?

7. What is meant by the phrase "buying feeder lambs on contract"?

8. What is meant by "contract feeding"?

9. Why do breeders of purebred sheep often maintain more than one breed?

10. State some of the important duties of the sheep caretaker.

11. Name the important diseases to which sheep are subject.

12. Name the important parasites of sheep.

13. Explain a method of treatment for the elimination of stomach worms from sheep.

14. Explain a treatment for the elimination of ticks and scab.

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CHAPTER XXIX

JUDGING SHEEP

The judging of sheep differs materially from the judging of either cattle or hogs because when competition is at all close, the hands must be used to a much greater extent than is necessary, even in close competition in cattle. It is true that an accurate impression of the general appearance, type, and breed characteristics of a sheep may be gained by observation, just as is the case with cattle or hogs. An estimate of strength or weakness in the detailed points of form, however, can be made only after a thorough examination of the sheep with the hands. Likewise, an estimate of the degree of fatness must be based on touch rather than on sight. The use of touch is essential to an accurate appraisal of the fleece.

The score card for the fat lamb serves as a guide or standard in the judging of sheep. Figure 73 shows the location of the different points of the sheep as covered by the terms used in the score card. A careful study of the score card and the diagram will make clear to the inexperienced judge the many characteristics that must be studied by the sense of touch in addition to those that may be readily studied by observation.

Method of Procedure in Examining a Sheep.—In judging a sheep, the judge should first observe the sheep carefully from the front, the side, and the rear positions to gain as accurate an impression as possible of its size, symmetry, compactness of form, straightness of lines, length of leg, length of neck and body, and width and depth of body. This general inspection by observation should then be followed by an examination by the hands. In handling, the fingers should be kept together rather than spread apart. By standing close to one side and facing the same way the sheep is facing, the hands may be pressed against the neck, one on either side, and an idea gained as to the length and thickness of the neck and degree of muscular filling of the shoulder vein. By passing the hands back to either

PERFECT SCORE FOR FAT LAMB

Scale of Points	Perfect Score
I. **Weight,** score according to age—6 months, 85 lb....	6
II. **Form**—53 points	
Head and neck—7 points	
Head. Face short; mouth and nostrils large; eyes large and clear; forehead broad; ears alert, not coarse; wide between the ears............	5
Neck. Short, thick, full at junction with shoulder..................................	2
Forequarters—9 points	
Shoulder. Smoothly covered with flesh; compact on top; even with body................	6
Breast. Full in outline and well extended.....	2
Legs. Straight; short, wide apart, strong; forearm full..................................	1
Body—22 points	
Chest. Wide, deep; heart girth full..........	2
Ribs. Well sprung, long, close, thickly covered	4
Back. Broad, straight; thickly and evenly covered..................................	8
Loin. Thick, broad; well covered...........	8
Hindquarters—15 points	
Hips. Neat; smoothly covered..............	1
Rump. Long, level, wide to dock; well covered	4
Thighs. Deep, wide, full....................	5
Twist. Deep, plump......................	4
Legs. Straight, short, strong, set well apart; pasterns straight..........................	1
III. **Finish.** Deep, even, firm covering over loin, back ribs, and shoulders; points indicating finished condition, thick dock, thick neck, and full shoulder vein, plump breast................................	12
IV. **Quality.** Head and ear medium size; bone fine....	5
V. **Fleece**—6 points	
Quantity. Long, dense; uniform in density and length....................................	2
Quality. Fine, soft; crimp distinct and even throughout fleece...........................	2
Condition. Bright, sound, clean; slight amount of yolk; foreign material not excessive............	2
VI. **Dressing percentage.** High finish, not paunchy....	8
VII. **General appearance.** Straight top and underline; deep, broad; uniform in width; low set, compact, symmetrical, stylish.........................	10
Total......................................	100

NOTE: The score card was prepared by staff members of the Division of Animal Husbandry, University of Minnesota, for use in the teaching of judging.

side of the shoulder, then to the foreribs, the loin, and the rump, an impression of the width and the uniformity of width is gained. By passing the hand along the spine, with the finger tips held together and bearing down gently at intervals of 2 or 3 in., an impression of the amount of fat covering over the spine is gained. This is a fairly accurate indication of the degree of fatness. Judgment as to the degree of finish may be verified by grasping the region about the tailhead between the thumb and four fingers of one hand to determine the amount of fat deposit in this region.

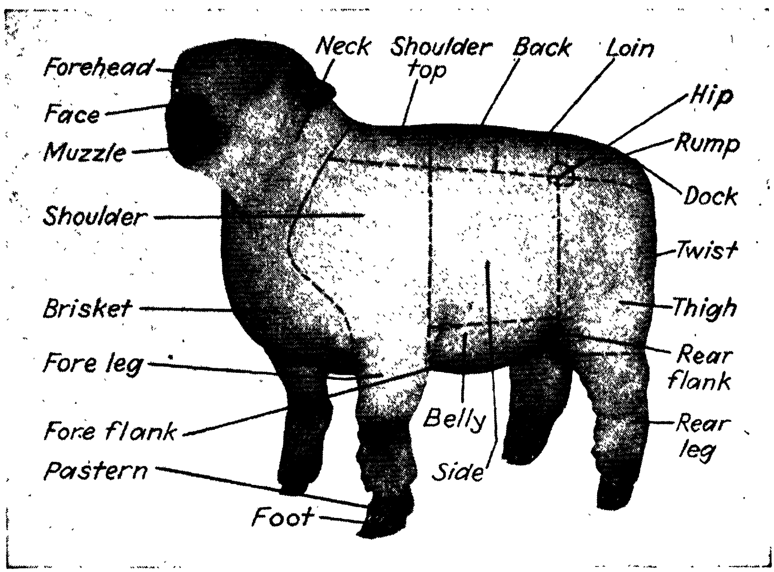

FIG. 73.—Showing location of parts of the sheep.

The amount of filling in the foreflank just back of the elbow is another indication of the degree of finish.

The length and fineness of quality of fleece are observed by placing the hands together, laying the small fingers and lower edge of the palms against the surface of the wool, then spreading the hands apart to open the fleece down to the skin. While the fleece is held open in this way, the color and condition of the skin should be observed, the amount of oil or yolk in the fleece should be noted, also the length, the fineness of fiber, the presence of any black fibers in the wool, and the brightness of the fleece. The density or number of fibers per unit of surface is determined

by grasping a handful of wool and mildly squeezing it. The fleece should be examined at least in three regions: over the side of the shoulder, over the midrib, and on the thigh. The finest wool is found on the side of the shoulder and the coarsest wool on the thigh.

Having completed the examination by observation and by handling, the judge should have a clear impression of all desirable characters and all weaknesses and be ready to place a rating or value on the animal as an entity. Practice in comparative judging of several animals is essential to the building of correct images in the mind of the beginner, just as it is in the judging of any other kind of livestock.

Judging Market Sheep.—Although careful and thorough examination as outlined above is essential in the selection of sheep for breeding use or in close competitive judging such as is encountered in the show ring, it is not essential or practical in dealing in large numbers on the markets.

Most of the judging that is essential in correct classification and grading of groups of market sheep is done by observation. Even so, the most experienced salesmen and buyers commonly have their helpers crowd a group of lambs or sheep into a corner of the pen and get their hands on enough of them to get a better idea of their thickness of muscle covering and their degree of finish. This is especially true in the classification, grading, and pricing of slaughter sheep and lambs.

Selecting Breeding Sheep.—In the past, the selection of sheep for breeding use has been based largely on the merit of the individual as determined by observation. This plan of selection has been extensively followed for two reasons: (1) There are so many types and breeds that there has been a wide variety of opinions as to those characters and qualities that constitute a true test of value in a sheep. (2) The dependence of the value of the sheep on the two products, wool and lamb, complicates the use of a performance record on which to base selection.

Selection Based on Ancestry.—Registry associations to guard the purity of the breeds of sheep have been maintained for a number of years. The more progressive breeders have paid some attention to the character of the ancestry of a ram before buying him for use as a flock ram. Comparatively little attention has been paid to the ancestry in the selection of flock ewes

except in the case of a few purebred flocks of long standing in which the owner has developed strains or families descended from a few outstanding ewes in the flock.

Selection Based on Progeny.—Because of the short life period of sheep, it is the practice even of the leading breeders to buy young rams for use as flock sires. Breeders of long standing frequently hold rams and ewes that have uniformly produced lambs of outstanding merit in use in their own flocks for their full life period. Seldom is such a ram or ewe available for pur-

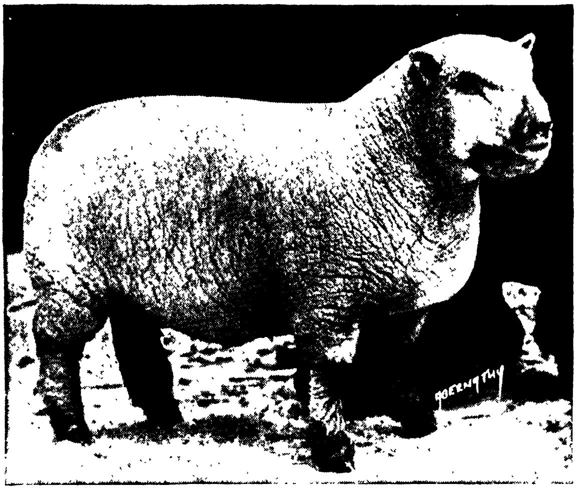

FIG. 74.—Southdown wether lamb, Grand Champion fat lamb over all breeds, International Livestock Exposition, 1939. Near ideal in mutton form. (*Photograph by Abernathy.*)

chase and use in another flock. When they are, other breeders hesitate to purchase them at their advanced ages and at the high prices asked for them, because the length of time they are likely to continue breeding regularly is uncertain.

Selection Based on Show-ring Winnings.—The show ring has been the only semblance of a performance test that has been used by sheep breeders in the past. The show ring has been of value as a performance test mainly in setting the standard and type for the various pure breeds. Even in this respect it has been open to criticism at times, because undue emphasis has been placed on minor breed characteristics at the expense of more important utility factors. Rams that have won prizes or rams

and ewes sired by prize winners have been in strong demand and have frequently sold at prices much above average because of their show-ring record or because of the show-ring records of their sires or dams. Show-ring winnings are the best available proof that a sheep is of correct type, but that is about as far as their value goes as an aid in selecting sheep for breeding use.

Selection Based on Performance.—No attempt has yet been made to develop a record of performance plan as an aid in the selection of sheep, but it is logical to assume that figures showing the grade and weight of fleece produced and the weight of lamb produced per ewe at a given age for the lambs would at least indicate those ewes and rams that were the most efficient producers in large flocks. The breeder who is willing to go to the trouble of keeping such records for his flock would find them valuable as advertising material as well as helpful in selecting for greater utility in improving his own flock.

Questions

1. How does the judging of sheep differ from the judging of beef cattle or hogs?

2. How would you proceed in examining a sheep in judging or evaluating it?

3. Name the seven important divisions in the scale of points for the fat lamb.

4. How does the judging of market sheep differ from the judging of breeding sheep?

5. In judging sheep, why is so much dependence placed on observation?

6. To what extent is the selection of breeding sheep placed on the merit of the ancestry?

7. To what extent is the selection of breeding sheep placed on the merit of progeny?

8. What is the significance of show-ring winnings as an aid to the selection of breeding sheep?

9. What information should be included in a useful record of performance for sheep?

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CHAPTER XXX

THE MARKET CLASSES AND GRADES OF SHEEP

The list of market classes and grades of sheep follows closely the pattern for the classes and grades of cattle and swine. One notable difference is that many sheep, principally ewes, intended for use as breeding stock are handled through the markets. A class for breeding sheep is listed. Many market-lamb producers prefer to buy mature ewes, keep them until they are no longer useful for raising lambs, then buy new ewes rather than to keep ewe lambs for replacements. Suitable flock ewes often sell for less money than fat ewe lambs. The slaughter sheep and lambs, the feeder lambs, and the breeding sheep combined provide a large movement of sheep through the markets each year, many of which go back to farms as breeding ewes and feeder lambs. In certain sections of the country many flock rams are purchased at the markets. They are not recognized, however, in the list of market classes. In rare instances is a good flock ram sent to market until he has about served his usefulness as a sire. The market is a poor place to buy a flock sire.

The Market Classes.—At the markets sheep are first grouped according to age into two groups, sheep and lambs, as follows:

Sheep:	Lambs:
Slaughter	Slaughter
Feeder	Feeder
Breeding	Shearer

A young sheep is called a "lamb" until it is about twelve months old. During seasons of the year when the lambs appearing on the markets are approaching twelve months old, their classification as lambs or yearling sheep is often determined by examination of the teeth. The young lamb has four pairs of incisor teeth on the lower jaw and none on the upper jaw. The first set are temporary or lamb teeth. At the age of about

one year, the center pair of incisor lamb teeth is replaced by a pair of larger, broader permanent teeth. If this center pair of permanent teeth is showing about fully developed, the animal in question is classed as a yearling. If the lamb teeth are all present, it is still classed as a lamb. The condition of the teeth as indicating the age of older sheep is also extensively used in dealing in breeding ewes. The first pair of permanent teeth appear at about one year, the second pair at two years, the third pair at three years, and the fourth or corner pair at four years. The age of the breeding ewe affects her value materially, so that ages are generally checked by the commission salesman by examining the mouth of each ewe. Yearlings are marked with a long, single, colored chalk mark down the back, two-year-olds with two marks, three-year-olds with three marks, and four-year-olds are not marked. Such marks will show clearly until the ewes have been shown to prospective purchasers. By the marks the buyer knows whether he is looking at yearlings, two- , three- , or four-year-olds and over. Once the sheep has a "full mouth" of permanent incisor teeth, the condition of the teeth can be used only to indicate that it is four years old or over.

The six market classes, slaughter, feeder, and breeding sheep and slaughter, feeder, and shearer lambs are determined by the use that will be made of the animals. The "shearer" lamb is a class designation used principally during the late winter and spring months to indicate a lamb that carries nearly a full year's growth of wool but is not yet fat enough to be a market-topping slaughter lamb. Such lambs are often purchased by men who take them to feed yards near the market, shear them, feed them until they are fully finished, then send them back to market as fat, shorn lambs. The term "shorn lamb" is used to indicate that the lamb in question has had its fleece removed within about two months from the time of its appearance at the market. In dealing and in market reporting during the spring of the year, the terms "shorn" and "wooled" should be added to the class names to indicate whether the price being quoted is for shorn or wooled sheep and lambs. The shearer lamb is always one with the wool on.

The Subclasses of Sheep and Lambs.—The subclasses of sheep and lambs are determined by sex condition, as illustrated in the table that follows:

Slaughter sheep:
- Ewes
- Wethers
- Rams

Feeder sheep:
- Ewes
- Wethers

Breeding sheep:
- Ewes

Slaughter lambs:
- Spring lambs
- Ewes
- Wethers
- Rams

Feeder lambs:
- Ewes and wethers

Shearer lambs:
- Ewes and wethers

An exception is made for the subclass of slaughter lambs designated "spring lambs." The spring lamb is recognized as a subclass of slaughter lambs, because the term has a significance that can be brought out in no other way. Like the class for shearer lambs, this subclass has a seasonal usage. As the term suggests, this subclass is used in dealing and market reporting during the spring months. Lambs classed as spring lambs are lambs born from December to February, fed well so that they grow rapidly and fatten at a young age and light weight. They begin to appear on the markets in April, when most lambs from the previous year's crop are approaching the twelve-month age limit. At this season of the year, many consumers are willing to pay a higher price for the meat of the younger lamb; hence the need of a subclass to distinguish the young lambs of the new crop from the older ones remaining from the previous year's crop. Later in the season, after all the lambs from the previous year's crop have been marketed, the spring-lamb subclass is dropped from use until the first ones appear again early in the following year. Because spring lambs are always slaughter lambs and are young in age when marketed, sex condition is unimportant and is not mentioned in dealing or quoting prices on them. Spring lambs may be ewe, wether, or ram lambs and sell at the same price per pound.

Some Additional Market Terms.—Several other terms are commonly used to clarify the market class and subclass designation of sheep and lambs. Among them the terms "native" and "Western" are extensively used partly to indicate the location of origin but further to indicate the breeding, type, and other characteristics of sheep due to breeding practices followed in the locality in which they originate. In market terminology a "native" sheep is one raised in the mixed-farming areas. Natives nearly always show grading or crossing involving a

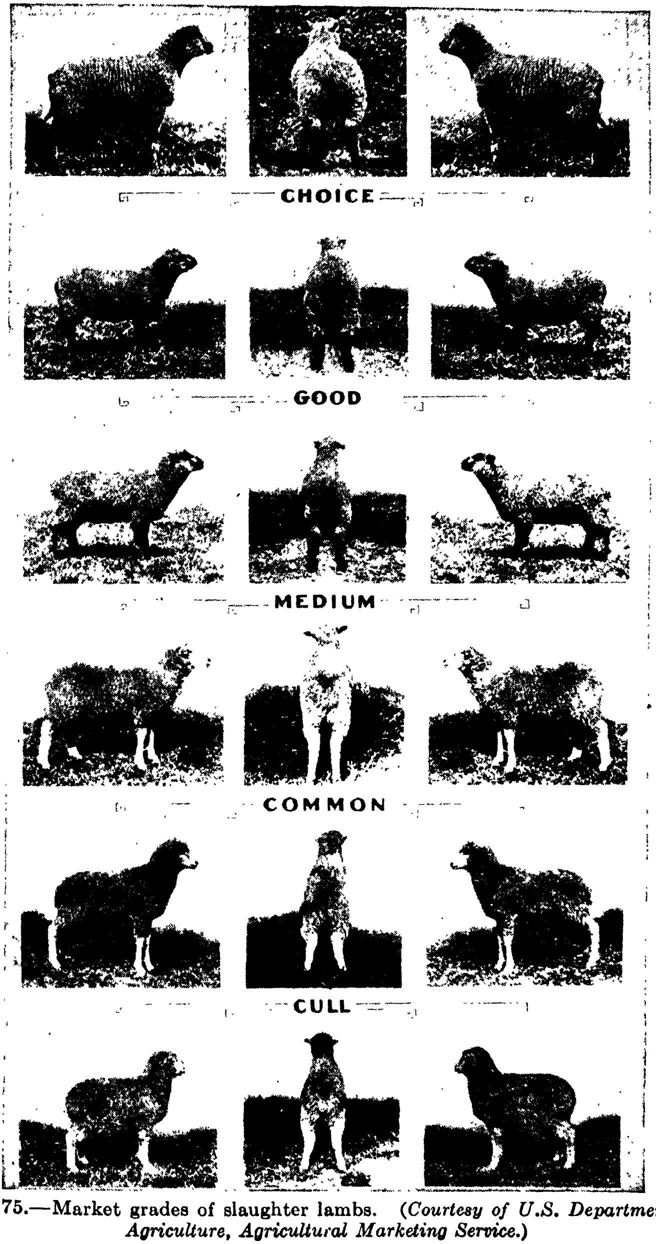

FIG. 75.—Market grades of slaughter lambs. (*Courtesy of U.S. Department of Agriculture, Agricultural Marketing Service.*)

mutton breed so that any sheep classed as a native will be of mutton form, generally dark in face and leg color, with fleece of medium fineness and density. "Westerns" are sheep raised in the Range areas of the West and Southwest. They always carry a high percentage of fine-wooled breeding, are white in face and leg color, and have a fine, dense fleece. Generally they are not so well formed from the mutton standpoint as are native sheep. The terms "native" and "Western" are most used and have greatest significance in dealing with breeding ewes and feeder lambs. The terms "whiteface" and "blackface" are sometimes used to indicate the general type and breeding of sheep and lambs without indicating the locality of origin. Since in recent years rams of some of the mutton breeds have been used on Western flocks to produce market lambs, the breeding of Western sheep may be indicated by calling them white-faced Westerns, or black-faced Westerns. A white-faced Western would be a sheep or lamb of Western origin, with fine-wooled breeding predominating; a black-faced Western would be one of Western origin, showing one or more crosses of mutton blood, as evidenced by the dark face and leg color, and closer adherence to mutton form. The name of the state of origin is often attached to the subclass rather than the terms "native" and "Western." A typical Texas ewe, for instance, is different in many characteristics from a typical Montana ewe, even though both are white-faced and both would be considered of Western origin. The Texas ewe will be smaller, not so well developed in mutton form, and finer and shorter in fleece than the Montana ewe.

Age and Weight Groupings.—Sheep that classify in the subclasses of fat and feeder sheep are commonly grouped by ages as yearlings and mature sheep. Both sheep and lamb subclasses are then broken down further into weight groups, which may be designated by a stated weight range, such as slaughter lambs, 70 to 85 lb.; slaughter lambs, 85 to 100 lb.; and slaughter lambs, 100 lb. up. Or they may be designated as light, medium, and heavy slaughter lambs. Age is of largest importance in dealing in breeding sheep; weight is most important in dealing in both slaughter and feeder lambs.

The Market Grades.—After sheep and lambs have been divided into classes, subclasses, and age and weight groups, based on the use to which they are best suited, they must be

divided further by grading into the several market grades, based on the degree to which they fulfill the requirements of their class and subclass grouping. The grade is based on the form, finish, and quality of the sheep, finish and quality having greatest significance in the slaughter classes, form and quality in the feeder and breeding classes.

Prime and Fancy Grades.—The grade of prime is applied to slaughter animals only and calls for a lamb or sheep that is nearly ideal in mutton form, ideal in degree of fatness, and ideal in quality of bone and firmness of flesh covering. The grade term applied to feeders good enough to give promise of finishing into prime fat lambs is fancy. They must be nearly ideal in mutton form, possess good quality of bone, and appear healthy and thrifty.

Choice.—The choice slaughter lamb or sheep lacks just enough in form or quality to grade prime. It must be fully fat. The choice feeder may lack the style and quality essential in the fancy feeder but must have nearly perfect form and be healthy and thrifty in appearance.

Good.—The slaughter lamb or sheep grading good will be noticeably deficient in form or quality or both and may not be quite so fat as would be desired but must not be decidedly weak in any one of the three important requirements. The good feeder lacks noticeably in form and quality but must be good enough in form to give promise of making a highly acceptable fat lamb.

Medium.—The grade of medium is applied to both slaughter and feeder sheep and lambs. The medium slaughter animal is appreciably lacking in form and finish and may be noticeably lacking in quality. The medium feeder is lacking in form and generally is in very thin condition but should appear healthy.

Common.—The common slaughter sheep or lamb is rather seriously lacking in both form and finish, so much so that the carcass can be sold only at a price considerably below the price of the medium grade of animal.

Cull.—"Cull" is the term applied to all sheep and lambs that are decidedly inferior. They are all lacking in form and finish and class as slaughter animals rather because they are unfit for use as feeders or breeding animals than because they have anything to recommend them as slaughter animals.

Inferior.—The lowest grade of sheep that may be used as feeders is designated as inferior. Animals so poor in form as to be graded inferior feeders are sold only as feeders when the demand is strong and the supply of more suitable animals limited. Generally sheep or lambs so deficient as to grade inferior feeders will go in the cull group and sell for immediate slaughter.

Discounting Long-tailed and Ram Lambs.—Young, light-weight slaughter ram lambs that have been grown largely on the milk of their mothers usually sell along with ewe and wether lambs without discount, but all other ram lambs of more advanced ages and heavier weights, whether they belong in the slaughter or feeder group, are discounted $1 or more per 100 lb. in selling price compared to ewe and wether lambs of similar class and grade. In the case of very thin or very large ram lambs, the discount may run as high as $3 per 100 lb.

A slaughter ewe or wether lamb that is otherwise of high grade will not be discounted because of a long tail, but lambs arriving at the markets and classifying as feeders will be discounted $0.50 to $1 per 100 lb. In any case, all lambs should be docked when ten days to two weeks old, and all ram lambs that are being raised for market should be castrated when not more than three to four weeks old.

Grading Breeding Sheep.—Ewes that are sold for breeding use are graded on much the same basis as feeder sheep. Principal attention is given to form, quality, fleece, and the appearance of health and thrift. Age is an important factor in determining the value of a ewe for breeding use, and it is the common practice in dealing in breeding ewes to check their age by their teeth. This can be done accurately to the age of four years, since the sheep gets its first pair of permanent teeth at one year old, the second pair at two years, the third pair at three, and the fourth pair at four years old. The value of a ewe that is more than four years old is based on the condition of her teeth and her general appearance. After four years, if the teeth of a ewe are worn down close to the gums, the ewes are called "gummers"; if the teeth are long and spread apart at the surface, the ewes are called "spreaders"; if some are missing, the ewes are called "broken-mouthed" ewes. All gummers, spreaders, and broken-mouthed ewes should be rejected in buying old ewes for breeding, since none of them is likely to hold up in flesh on winter feeds.

A Sheep-market Report.—Table XVI is a sample sheep-market report taken from a daily paper published in a large city in which a large central livestock market is located.

TABLE XVI.—SHEEP QUOTATIONS,* SLAUGHTER LAMBS AND SHEEP

Spring lamb:	
Good and choice	\$11.00–\$11.75
Medium and good	10.00– 10.75
Common	9.00– 9.75
Lambs (shorn):	
Good and choice	8.50– 9.00
Medium and good	7.75– 8.25
Common	7.00– 7.75
Ewes (shorn):	
Good and choice	3.75– 4.75
Common and medium	2.50– 3.75

* Quotations are based on animals of current seasonal market weights and wool growth. Shorn animals with less than 60 days' wool growth are quoted as shorn. Quotations on slaughter lambs of good and choice and medium and good grades as combined represent lots averaging within the top half of the good and the top half of the medium grades, respectively.

Questions

1. In what way does the list of market classes of sheep differ from the classes for cattle and hogs?

2. Name the market classes of sheep and lambs.

3. How is the age of sheep determined from the appearance of the teeth?

4. Define the term "shearer lamb."

5. How are the terms "wooled" and "shorn" used in market terminology?

6. Name the subclasses of sheep and lambs.

7. Define the term "spring lamb," and state how it is used.

8. What is the significance of the terms "native" and "Western" as used in sheep-market classification?

9. What is the significance of the terms "whiteface" and "blackface" as used in sheep-market classification?

10. What is the importance of age and weight in the classification of sheep and lambs?

11. Name the market grades of sheep and lambs.

12. Under what circumstances are long-tailed and ram lambs discounted on the market?

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SECTION VI

Horse and Mule Production

CHAPTER XXXI

USES AND ADAPTATIONS OF HORSES

Throughout civilization, the horse has been of value to man as a source of power rather than as a source of food or clothing. Horses were first used to carry riders on their backs and to carry goods supported on their backs. This was followed by the fastening of two poles in such a way that one end of the poles rested on the back and the other ends on the ground. A basket-like arrangement between the two poles just to the rear of the horse served to carry passengers or goods. Then the poles came to be supported by a wooden axle and two wheels made of wood, thus forming a two-wheeled cart. It was not until harness made of leather, with the pull exerted from the shoulders rather than the back, was invented that the maximum ability of the horse to draw a load was realized. The later development of four-wheeled vehicles, with wheel spindles made of iron, wheel hubs lined with iron, and wheels with iron tires, reduced to a minimum the resistance of the vehicle and made possible the drawing of loads weighing several times as much as the horse.

Throughout the eighteenth and nineteenth centuries, the horse experienced an ever-increasing usefulness, and man became more and more dependent upon him as a source of power. Horses were used as the source of power for transportation in travel, for transportation of merchandise, for drawing machines used in tilling the fields, harvesting crops, digging excavations, building roads, and in many other specialized types of work. During this period the horse also supplied a large amount of stationary power through the use of the sweep power unit, such as the power units used in operating threshing machines before the advent of the steam engine. Because of the many and varied uses to

which horses were put, many types were developed, ranging from the diminutive pony weighing 400 lb. or less to the massive draft horse weighing 2,000 lb. or more. Between the two extremes were horses of all shapes and sizes with adaptation to one or more of the many specific purposes for which they were needed.

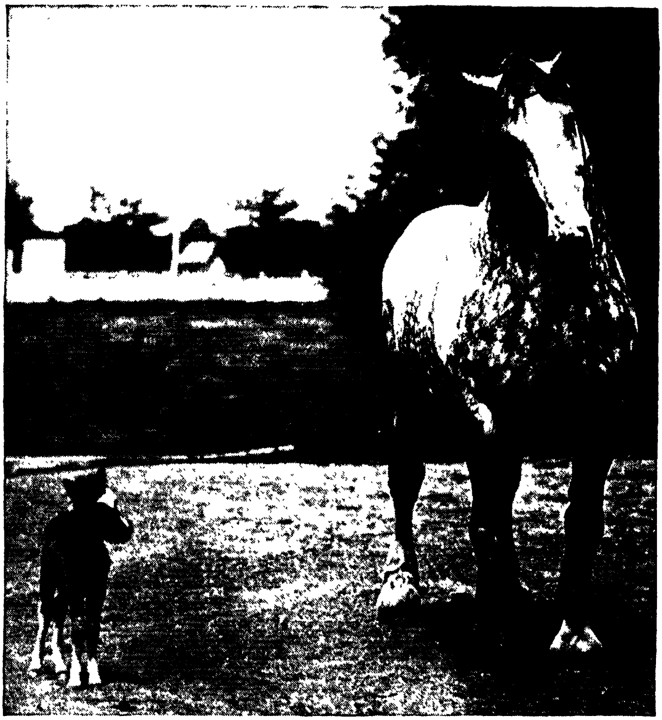

FIG. 76.—Horses vary greatly in size. (*Courtesy of Iowa State College.*)

The horse proved more useful than any other type of animal as a source of power, not only because of the suitability of his form and gait to the carrying of a rider comfortably and his ability to exert a heavy pull with his shoulders but because of the strength of his legs, the toughness of his hoofs, his speed, his stamina, his long life span and, above all, his intelligence. This high degree of intelligence, together with a symmetry of form, grace of movement, and beauty not found in any other animal has always inspired the admiration of man and pride in the ownership of a good horse. It was probably a combination

of admiration of equine beauty and pride of ownership that led men to select and breed those types of horses used under the saddle and for drawing light vehicles for still greater beauty, speed, and stamina.

When the first horse race was run is wholly a matter of conjecture. One is safe in saying that it was many hundreds of years ago. It is just about as safe to venture the suggestion that "pride of ownership" was the reason why it was run; the object being to determine which of two rival owners, had the faster horse. Following the day of the first horse race, whenever that was, horse racing developed into the most fascinating sport known to man. More money has been wagered on horse races during a year than on any other sport. Many stables of race horses and many race-horse-breeding farms are maintained in parts of the United States.

Replacement of Horses by Mechanical Power.—It was the beginning of the industrial age that first created a large need for horses to transport manufactured goods and to produce agricultural products to supply food for people living in the cities and working in the factories. It is ironical that continued development and inventions in industry are responsible for the present replacement of horses by mechanical power. Three forms of mechanical power, steam, electricity, and gasoline, have each contributed to the decline of horse use. The invention of the steam engine and the electric motor at first so stimulated manufacturing and industrial development that their replacement of horses was not felt. In fact, they so stimulated industrial development that more horses rather than fewer were needed to do the work to which the steam engine and electric motor were not well adapted, even though these two forms of power had replaced the horse for long-distance transportation and for stationary power.

It remained for the gasoline engine, with its adaptation to use in small units, and to small motor vehicles to replace the horse in those fields of work not invaded by steam and electricity. The rapid improvement in gasoline engines during the last 25 years and their adaptation to practically every type of service formerly rendered by horses brought about their complete replacement in some forms of work formerly done by horses and partial replacement in practically all forms of work. The point has

been reached where the three forms of mechanical power together threaten the complete replacement of horses as a source of power. It is maintained by some manufacturers of gasoline engines that complete replacement awaits only the ingenuity of man in inventing more new types of gasoline-propelled machines that will be better adapted and more economical than those now available.

Present-day Horse Use.—Although replacement has caused a marked reduction in the number of horses from the high point reached about the year 1917, there were in 1941 about 10,000,000 horses and 4,000,000 mules in the United States. The principal present-day uses of horses are (1) in farm work, (2) in delivery service in cities, (3) under the saddle in commercial work, such as herding cattle and sheep on ranches, (4) in pleasure riding, (5) in horse racing, and (6) in armies.

Horses for Farmwork.—Throughout the last 200 years or more, the most important use of horses has been for drawing farm implements. Today more horses are used on farms than in all the other fields of horse service combined. Steam and electricity did not replace horses to any considerable extent in this field. Although gasoline power has invaded this field and replaced horses for many of the varied types of farm work, it is a question just how far the farmer can go in the replacement of horses without increasing his power cost and decreasing the income from his farm. The horse holds a number of advantages over mechanical power for many types of farm work. These advantages[1] may be listed as follows:

1. Horses utilize home-grown feeds, thereby providing a market for crops and eliminating the necessity of a cash outlay for motor fuel.
2. They can be worked singly or in multiple hitches in accordance with the amount of power needed for the work to be done.
3. They are well suited to jobs that require frequent starting and stopping.
4. They can be worked on soft, wet land as well as on rough, hilly land.
5. Mares may be worked, and at the same time colts may be raised for replacements.
6. The manure produced assists in maintaining soil fertility.

[1] Harvey, A. L., Using Horses on the Farm, *Minn. Agr. Expt. Sta. Ext. Bul.* 145, 1938, p. 3.

Keeping in mind the foregoing advantages for continued horse use on farms, the efficient farm manager should consider how all the angles of horsepower replacement by mechanical power will affect operation costs and income from his farm before proceeding with such replacement. Many farmers have already worked out a partial replacement only, as the most efficient and economical plan by which to provide the necessary power. On such farms those tasks that can be most effectively and economically done by mechanical power are done that way, the remainder being done by horses.

FIG. 77.—Farming in a large way with horse power. (*Courtesy of Horse and Mule Association of America.*)

Horses for Delivery Service in Cities.—As recently as thirty years ago, all short-distance delivery service was accomplished by horse-drawn vehicles. A great variety of types and sizes of horses were used in this service. For the light delivery service, horses of the light types that could cover ground quickly were in demand, whereas for delivery of heavy merchandise large draft horses were most efficient. Today only a sprinkling of the large horse populations of cities remains. A few are to be found, however, in nearly every city in the country. They are used principally on milk- and bakery-delivery wagons, railway-express and short-haul freight deliveries, and, to a very minor extent, by various merchants of all kinds. Much of the delivery service in cities could still be done by horse-drawn vehicles at lower cost than by motor trucks, but many factors other than cost enter in to cause most businessmen to prefer the motor

delivery and pass the added cost along to the consumer. Since truck delivery is now universal, its added cost is no longer a factor in competition between business firms.

The Saddle Horse in Commercial Service.—Although the use of the horse for carrying a single rider on his back has been taken over to a very large extent by the automobile, there remain several types of service that can be rendered more advantageously by the horse under saddle than in any other way. They include such work as the transportation of the buyer and the salesman at large cattle markets, the work of driving or herding cattle in large groups on farms and ranches, the supervision of large

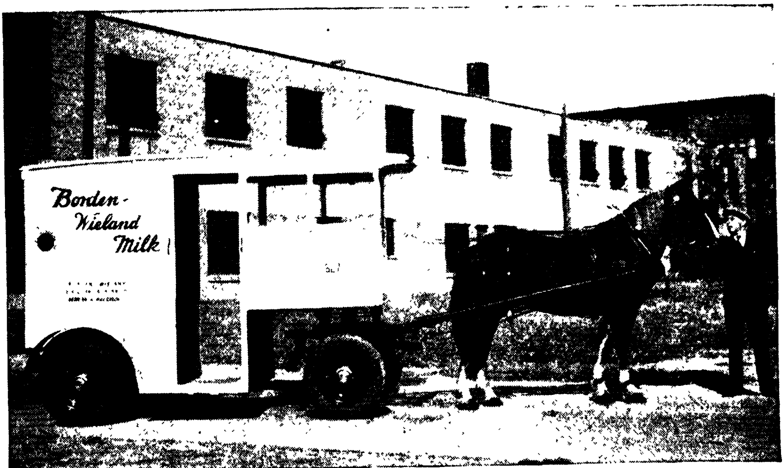

FIG. 78.—An ideal milk-wagon horse. (*Courtesy of Horse and Mule Association of America. Photograph by Cook and Gormley.*)

groups of workers on large agricultural enterprises of several kinds, and the work done by mounted police in large cities. Although the number of horses required in this field of service is small, it is probable that this number will not soon be replaced.

Horses for Pleasure Riding.—The horse for pleasure driving has been completely replaced by the automobile; however, there persists an interest in horseback riding for pleasure that creates a demand for a considerable number of horses suited to this use. Riding is often suggested by doctors as a healthful form of exercise for patients suffering from certain types of illness. Interest on the part of a few people in maintaining horses for exhibition at horse shows contributes to the general interest in

saddle horses of the pleasure-riding type. Many people, especially in the Southern and Eastern states, maintain one or more saddle horses for pleasure riding. Many riding academies are maintained adjacent to large cities and at summer camps. Horseback riding is one of the attractions at the "dude" ranches throughout the Western states. A few saddle horses are used in polo playing.

During the last five years there has been a marked increase in pleasure riding. Most riders who can afford to own well-trained,

FIG. 79.—A group of pleasure riders. Horseback riding is becoming a more popular recreation with each succeeding year. (*Courtesy of Horse and Mule Association of America. Photograph by Abernathy.*)

gaited, American Saddle Horses prefer them. Perhaps, as a fad, many pleasure riders like to own a horse of unusual color or a horse possessing some other unusual characteristic. Such tastes have led to a demand for such new strains of horses, as the American Quarter Horse, the Tennessee Walking Horse, the Palomino, the Appaloosa, and the Albino. Many persons will pay a good price for a horse of their choice from one of these new strains. All are of saddle-horse size and type. Most of them carry a great deal of saddle-horse breeding from the Thoroughbred, Arabian, or American Saddle Horse breeds.

Horses for Racing.—As stated earlier in this chapter, the horse race is a very old institution. A type of horse race popular many years ago was the chariot race, such as the one described

in the novel "Ben Hur." In the early chariot races, two or more horses were hitched abreast to a two-wheeled cart, hung low to the ground in which the driver stood. This was superseded by the trotting race, in which horses were driven singly hitched to a light two-wheeled cart, in which the driver sat. The trotting or pacing race came into popularity with the development of the use of light horses for light commercial vehicle and pleasure driving. This period began in the United States about the year 1800 and continued into the decade from

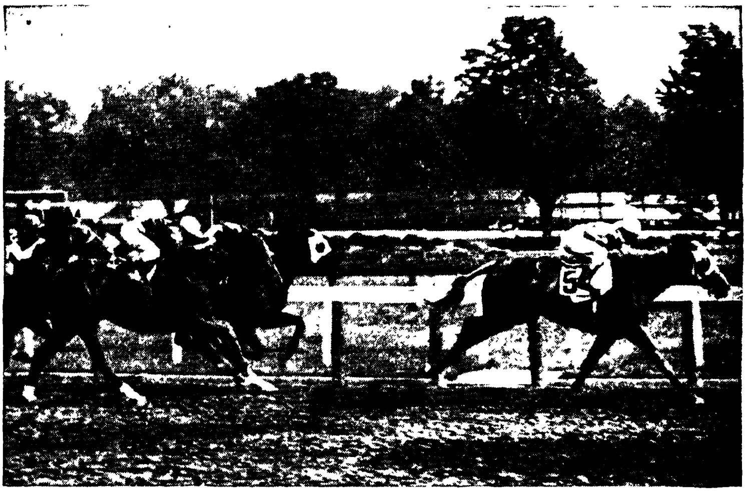

FIG. 80.—The "sport of kings." Note position of legs of the several horses showing the several phases of the running gait. (*Photograph by Acme.*)

1910 to 1920. During this decade, the automobile and light truck almost completely replaced the trotting horses for both commercial use and pleasure driving. This also brought about a marked decline in interest in the harness type of horse race. It is only since 1920 that the running race under the saddle became the leading type of horse race in this country, though the running race had for many decades held greatest favor in Great Britain and several other countries.

Factors accounting for the popular favor of the horse race in the face of decline in horse use probably are (1) the love of the American people for all forms of outdoor sports, (2) their admiration for a good horse, and (3) the open organized betting that is permitted on horse races at many tracks in several of the states.

Prizes on horse races at many tracks are large enough to induce some persons to breed race horses or maintain racing stables in the hope of making the enterprise pay through prize money won or through the sale of horses. It is probably this incentive that keeps up the production of enough race horses to keep the tracks supplied.

Horses in Warfare.—Since his domestication, the horse has been of value to man in defense of himself against enemy attack as well as in aggressive warfare. He has been used to carry soldiers who fought on horseback, to transport men, supplies,

FIG. 81.—A United States Army Cavalry Rifle Troop. (*Courtesy of Horse and Mule Association of America.*)

munitions, and cannon, and as officers' mounts in infantry ranks. Horses were extensively used for all these purposes as recently as during the First World War of 1914–1918. Mechanized armies in which the horse has been replaced by gasoline-driven trucks, tractors, and tanks are a development of the last twenty years. The present use of the horse in modern armies is limited largely to use as officers' mounts, though some cavalry units are still maintained in the armies of most countries, and many horses are still used for transport of supplies.

Adaptation of the Horse to Production.—Horse production has always been carried on in a different manner from the production of cattle, hogs, and sheep. Cattle, hogs, and sheep have succeeded best under large unit production. One farmer specializes in beef cattle, another in dairy cattle, and another in

sheep. Enough females are kept to make practical and economical the ownership of a sire used only in mating the females on the one farm. Since horses are used to do work, some are found on every farm, but stallions are maintained on only a few farms.

Production of Work Horses.—Early in the history of horse production, it became apparent that the cheapest and most satisfactory way to secure replacements was to mate mares on each farm and let them raise colts while continuing to do their share of the work. It also became apparent that attempts to expand horse production by maintaining large bands of mares were expensive and were fraught with hazards that did not appear to the same extent in the raising of cattle, sheep, or hogs. Some of the most serious difficulties encountered in attempting to raise horses in large numbers on one farm were (1) the high cost of maintaining an idle mare for a year; (2) the fact that under most favorable circumstances a 60 per cent colt crop was about the best that could be secured; and (3) the fact that in many instances the occurrence of abortion in mares and navel ill in colts reduced the percentage colt crop still further. These influences made the cost of the colt so high that he could not be sold at a profit.

On the other hand, the maintenance on every farm of only the number of horses needed to do the work and the breeding of those mares among the number that are suitable as brood mares make possible the raising of one to three or four colts each year on every farm without interfering much with the amount of work secured from the mares. Colts raised under this plan are produced at low cost. If a mare does not raise a colt, practically no loss is incurred, because she is needed for work anyway.

Under this plan, the maintenance of a stallion for use as a sire by each farmer does not prove profitable. This problem was solved by the public-service plan of stallion management. One farmer in a community would maintain a stallion and at a fixed service fee mate to him mares belonging to his neighbors. In some instances, one man would own several stallions and make the care and standing or traveling them for public service his major enterprise. Sometimes the stallion was owned jointly by a number of farmers, who formed a company specifically for the purchase and maintenance of a stallion. Occasionally a farmer would prefer to own a stallion, and by breaking and using

him as a work horse, the cost of maintenance would be materially reduced.

Thus, to a large extent, work-horse production has for years been widely distributed on many farms throughout the country rather than being centralized in large unit production on only some of the farms in favorable localities. Continuation of this plan is to be recommended for future production, since it is the cheapest and most satisfactory way to secure replacements.

Production of Light Horses.—The history of light-horse production in the United States is linked closely with the history of the Southern states. The American Trotting Horse and the American Saddle Horse are two breeds of light horses having their origin in the United States. Both were developed largely in the Southern states. The better trotting horses, as well as the better American Saddle Horses, Thoroughbreds, and Arabians, have always been produced in large studs in which a number of mares are maintained. Since the better light horses are produced for sale as pleasure riding animals or for racing, they sell at higher prices than work horses. It is possible to maintain a mare for the production of a colt whether she works or not. There is an advantage in having a number of mares in a stud so that it will pay to maintain a high-class stallion as a sire.

A large part of the value of a light horse is in his training. Large light-horse-breeding establishments generally employ professional trainers and provide equipment for training the colts raised before they are sold. Many buy additional "green" colts and train them. Other specialized training stables are maintained, to which green colts owned by small breeders may be sent to be trained upon payment of board and the training fee. Such specialized light-horse-breeding establishments and training stables were first common to the South, but they later spread over the entire country. With the decline in use of light horses, many breeding establishments and training stables have gone out of business, but a large number of them are still maintained for the production and training of pleasure riding horses and race horses. Interest is maintained in race-horse breeding partly because there are always the hope and the possibility of producing one capable of winning major races, where the stakes amount to thousands of dollars, and such a winner may be sold for many thousands of dollars.

In earlier times, most farmers maintained one or two light horses that generally served both as saddle horses and driving horses for making the necessary trips to town, for making social calls, and for pleasure driving. If the light horse on the farm happened to be a mare, she was mated to a light stallion if one was available; otherwise, to a draft stallion. Many good light horses have been produced in this way, but the larger percentage have been mediocre in merit, and many have been misfits in type. Since practically all errands and pleasure trips of farmers are now made by automobile, the light horse is rapidly disappearing from farms as well as from cities. The Southern states are an exception, because there still remains a greater interest in horseback riding and in horse racing in the South than in most other parts of the country. The light mares are also needed in mule production in that area.

Questions

1. Explain the early uses made of the horse.

2. What was the effect of the invention of the steam engine and electric motor on horse production?

3. What was the effect of the invention of the gasoline engine on horse production?

4. State the present-day uses of horses.

5. What are the specific advantages of horses as a source of farm power?

6. What has been the plan of producing work horses?

7. Why are work horses generally not produced in large groups?

8. State three plans by which stallion service may be made available in work-horse production.

9. How has the production of light horses differed materially from the production of work horses?

10. Why are many people interested in breeding race horses when commercial light-horse use has all but disappeared?

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CHAPTER XXXII

BREEDING HORSES

The ancestry of the modern horse traces to three early forms, one found in central Asia, called the "Prejvalsky," one in northern Africa, called the "Libyan," and one in northern Europe, called the "Celtic pony."[1] It is thought that the present-day breeds of ponies trace directly to the Celtic pony, present-day breeds of light horses to the Asiatic Prejvalsky, then to the Libyan, and that present-day draft breeds are the result of a combination of the Prejvalsky and the Libyan types. Behind all these is considered to be one type known as the "dawn horse." It is thought by most writers who have attempted to study the early history of the horse that all present-day horses are descended from a type of animal existing many thousands of years ago that differed materially in form and habits from the present-day characteristics. This early horse is pictured as a very small animal, with several toes rather than a solid hoof. It is thought that this early precursor of the horse also had short, soft teeth and lived in low, wet swamps, where the vegetation consumed was coarse and soft. It is believed that a change in habitat from the swamps to higher, dry ground was responsible for the development of the solid hoof and the enamel-covered teeth. Increase in size was a slow process, covering many hundreds of years.[2]

Although various ancient tribes of people are credited with giving some attention to the control of matings in selective breeding, authentic history of controlled breeding of horses dates back only 200 to 300 years and began in Great Britain and western European countries, the same part of the world in which early efforts to improve most other kinds of domesticated

[1] RIDGEWAY, WILLIAM, "The Origin and Influence of the Thoroughbred Horse," Cambridge University Press, London, 1905.

[2] MATTHEW, D. W., The Evolution of the Horse, *Quart. Rev. Biol.*, vol. 1, 139, 1926. RIGGS, ELMER S., The Geological History and Evolution of the Horse, *Leaflet* 13, Field Museum of Natural History, Chicago, 1932.

animals began. From this point to the present, methods of horse breeding for improvement coincide with the method used in the improvement of other kinds of farm animals. One significant distinction was that the many different uses made of horses caused selection to be directed toward the perfection of a number of types rather than toward only one or two, as with cattle, sheep, and hogs. The several types of horses were created by selection of those animals that succeeded best in specific kinds of service and by crossing strains that in several instances were brought together from different parts of the world. In time, just as in the improvement of other kinds of livestock, the more useful of these strains became pure breeds.

THE BREEDS OF DRAFT HORSES

All of the pure breeds of draft horses from which animals were later imported to the United States to improve the work stock of this country had their origin in western Europe or Great Britain. Chief among them were the Percheron, Belgian, Clydesdale, Shire, and Suffolk.

The Percheron.—Originating in northwestern France in the province of La Perche, the Percheron was first recognized as a breed about 1850 and has been bred without the introduction of new blood since that time. The topography of the surface in La Perche was hilly, with many small river and creek valleys. The soil of the valleys was fertile and high in limestone content, whereas that on the plateaus was lighter and less productive. The rich grasslands of the valleys provided the best of pasture on which brood mares and colts were grazed through more than half of the year. These rich pastures, growing on soil of high calcium content, are credited with contributing much toward the size, excellence of form, flintlike bone, toughness of feet, and wearing quality or durability of early Percheron horses. The Percheron of the period from 1800 to 1870 is described as a horse of compact form, weighing 1,400 to 1,600 lb., with an active disposition and brisk action at both walk and trot. This type is thought to have been produced by the crossing of Arabian, Barb, and Turk horses imported to France on the stock native to this section of France during the eighteenth century.[1]

[1] SANDERS, A. H., and W. DINSMORE, "A History of the Percheron Horse," Sanders Publishing Company, Chicago, 1917.

Early in the development of the Percheron, the management practice was that farmers operating the smaller farms owned mares, and those operating the larger farms owned stallions as well as mares. The larger farmers served as stallioners and leased or traveled stallions among the smaller ones for the mating of the mares. The brood mares served as work horses on the smaller farms while raising their colts. The larger farm owners then served as dealers, purchasing the surplus colts raised by the mare owners when they were one to two years old. The dealers then marketed the horses in various ways. After about 1870, many were sold for export to foreign countries.

The first Percheron horse imported to the United States is said to have been a horse called Louis Napoleon, imported to Ohio in 1851 and sold into Illinois in 1856. He was described as dark gray in color, 16 hands high, and 1,600 lb. in weight. A stallion called Normandy or Pleasant Valley Bill was also imported to Ohio in 1851. Only a few Percherons were imported until the year 1870, when importations of larger numbers began and have continued down to the present time, though the numbers imported in recent years have been small. Percherons imported up to 1870 were of medium size, compact form, and active disposition but lacked the size desired by American farmers. The selection and purchase of the largest stallions and mares to be found in France by American importers of the period 1870–1890 led French breeders to select for greater size and resulted in the production and sale for export to America of many stallions weighing 2,000 to 2,200 lb. and many mares weighing 1,800 to 2,000 lb. These larger Percherons continued to be popular in the United States until the last few years. Since the large trucks have replaced the heavy horse-drawn drays on city streets and tractors are replacing the big horses for the heavy farm work, there is no longer a need or demand for extreme size and weight in a work horse. As a result, breeders in the United States are now selecting for stallions weighing 1,800 to 2,000 lb. and mares weighing 1,600 to 1,800 lb.

During the period of extensive importation of Percherons (1870–1890), there developed in the United States a number of large importing firms that made a business of importing large numbers of horses from France and selling them to farmers and smaller breeders in the United States. For years the belief

prevailed that horses the equal of those produced in France could not be raised in the United States. As a result, American farmers did not try to breed high-quality large stallions. This situation left a large demand for stallions to be supplied by the importers, and for years importing stallions proved a very profitable enterprise. Importations continued heavy from 1870 to 1890, then declined through the decade 1890–1900. Importing began to increase again about the year 1898 and continued to about 1915, since which time importing has continued a steady decline, until now there is not a single firm remaining that makes a specialized business of importing draft horses. Many of the importing firms imported horses of several breeds. With decline of importing, a number of breeding farms were developed on which the raising of purebred Percheron horses was made the principal farm enterprise. The larger of these have either gone out of business entirely or greatly curtailed their horse-breeding enterprise during recent years. The breeding of purebred Percherons in America is now carried on largely by farmers who keep no more mares than are needed to do the farm work and raise colts as a side line rather than as the principal farm enterprise.

Registry Associations.—The first association formed to register Percheron horses was organized in the United States in 1876. The purpose was to maintain the purity of breeding of Percherons imported from the province of La Perche in France. It was decided by this association that only horses bred in La Perche or American-bred horses tracing wholly to ancestry in La Perche would be accepted for registry by the association. Since draft horses were being imported from other parts of France by some importers who were also importing Percherons, this group broke away from the first Percheron Registry Association and formed another, known as the National Registry of French Draft Horses. This association terminated its existence in 1927. The Percheron Horse Association of America continued to register only horses imported from La Perche and published a record book at intervals under the title "The Percheron Stud Book." The association has continued to be active until the present time. The office of the secretary is in the Exchange Building, Union Stock Yards, Chicago, Ill.

Percheron Type.—Starting as a medium-sized horse of compact type, active disposition, and ability to travel easily at the trot,

the Percheron was developed into a much larger horse, suitable for drawing heavier loads but at the walk rather than at the trot. This larger type remained popular from about 1880 to 1930. Less emphasis has been placed on size since 1930, but it is only in the last five years that buyers have been demanding a decrease in size and only during the last two or three years that breeders have begun to give preference to horses of somewhat smaller stature than formerly. The typical Percheron of today

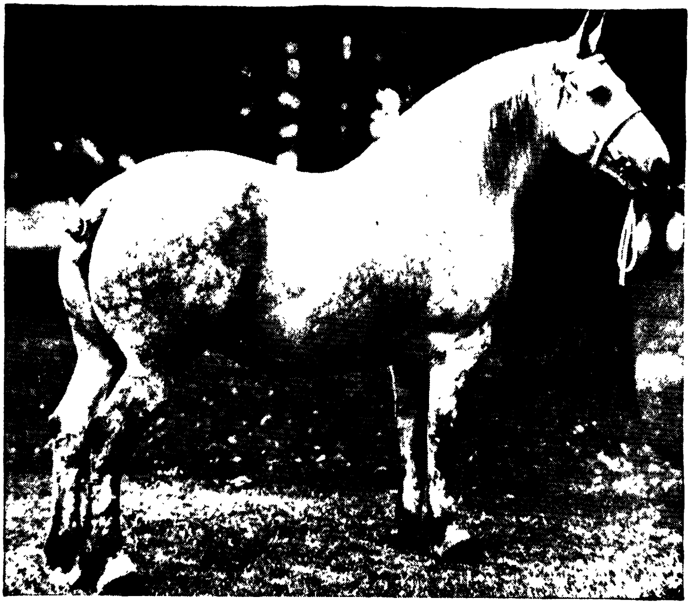

FIG. 82.—The Percheron mare Nerva. Grand Champion Percheron mare, International Livestock Exposition, 1940. (*Photograph by Abernathy.*)

is a horse black or gray in color, standing 16 to 16.2 hands high and weighing 1,800 to 2,000 lb. for stallions and 1,600 to 1,800 lb. for mares. The typical Percheron appears short and broad in head, medium in length of neck, broad, deep, compact, heavily muscled and symmetrical in body form, medium in length of leg, heavy-boned and clean-cut about the legs and pasterns, with large, tough-appearing feet.

The Belgian.—As its name would indicate, the Belgian breed of draft horses originated in western Europe just to the north of France, the home of the Percheron. The topography of Belgium is largely low-lying, and the land is fertile. The climate is

warm and humid in summer and cold in winter. The area covered by Belgium was the home of the early Flemish horse, the first horse of large size to be found anywhere in the world. Horses of this stock not only provided the foundation for the Belgian breed but are thought to have entered into the formation of all the draft breeds of western Europe and Britain.

The early Flemish horse was black in color, of large size, and muscular but lacking in the symmetry, style, quality, and action desired in the work horse of the early nineteenth century as well as in the work horse of today. The legs were poorly shaped and the feet small. From this early type, the modern Belgian has been developed largely by selection. A considerable amount of inbreeding was practiced by Belgian breeders during the latter half of the nineteenth century, and it is thought that the introduction of some Clydesdale and possibly some Shire blood is responsible for some of the improvements that were made in the breed during the period 1850–1900. It was during this period that the breed began to show wide variations in color from the black of the old Flemish stock. There were bays, browns, sorrels, chestnuts, and roans, many of them marked with blazed faces and some white on the legs. During this period the horses of Belgium began to show neater appearing heads, longer necks, more sloping shoulders, cleaner, straighter legs, flatter bones, larger feet, and more sloping pasterns. These were all characteristics possessed by the Shire and Clydesdale breeds, particularly by the Clydesdale. It is at least logical to assume that some introduction of Clydesdale and possibly Shire blood was responsible for these changes in characteristics, even though no acknowledgement of it was made by Belgian breeders of that time. There seems to have been no other place or way in which these changes in characteristics and improvements could have been made so quickly.

The improvement of Belgian horses by breeding was for years encouraged by the Belgian government through the offering of prizes for the best stallions exhibited at district shows. Young horses had to be approved by a committee before they could be exhibited; then they had to be exhibited before they could be offered for public service. In addition to the prizes, the owners of some of the best horses were paid a bonus by the government, provided the horses were retained in the country rather than

sold for export. Beginning as early as 1850, many stallions and mares were sold by Belgian breeders for export to other countries, notably to Germany.

The first Belgians of any consequence in their influence on the horse stock of America were imported to Iowa about the year 1890. The early imported Belgians lacked much in symmetry, style, quality, feet, and action, but they were big, very deep-bodied, and muscular and were easy feeders. They attracted favorable attention from farmers, largely because of their quiet disposition, large size, and easy keeping qualities. Noting their favorable reception, a number of importing firms developed and began to bring over Belgian horses and to sell them to farmers. The periods of greatest activity in importing Belgians extended from about 1900 to 1915. During this period some of the Percheron importers began to import some Belgians each year as a part of their business. Many of the early Belgian importers began to breed Belgians as well, and when importations had to be stopped during the First World War, these men continued to breed Belgians extensively in this country. By selecting for a more symmetrical, slightly more upstanding type of flat-boned, large-footed, active horse, American breeders of Belgians succeeded in producing a type of draft horse that has been received with high favor among American farmers during the last twenty years. In the face of a declining interest in draft horses and a weak market for horses generally, purebred Belgian stallions and mares have continued to command ready sale at the highest prices obtainable for any type of draft horse during the last ten years. Still outnumbered by Percherons, the Belgian must be conceded the position of highest favor with the farmer producers of work horses at the present time.

Registry Associations.—The Belgian Draft Horse Society of Belgium was founded in 1886 and has continued to handle the registration of Belgians in Belgium to the present time. The American Association of Importers and Breeders of Belgian Draft Horses was organized in 1889 and has maintained registration at the office of the secretary at Wabash, Ind., since that date. The name of the association was recently changed to the Belgian Draft Horse Corporation of America.

Belgian Type.—Although there is still some variation in type and color within the Belgian breed, the approved type is generally

agreed upon by all leading Belgian breeders. It calls for a horse that is sorrel, chestnut, or red roan in color, though Belgians of any color are accepted for registration. The approved type calls for stallions standing 16 to 17 hands and weighing 1,900 to 2,100 lb. and mares standing 16 to 16½ hands and weighing 1,800 to 2,000 pounds. The typical present-day Belgian is a horse of medium length of neck, body, and leg, possessing good

FIG. 83.—The Belgian stallion, Jay Farceur, Grand Champion Belgian stallion, International Livestock Exposition, 1940. (*Photograph by Abernathy.*)

width and depth of body and a smooth-turned, symmetrical, muscular appearance, with good slope of shoulder, flat bone in the legs, good slope of pastern, and large tough hoofs. These characteristics replace the short neck, short, clumsy-appearing body, steep croup, straight shoulder, round bone of the legs, straight pasterns, and small feet of the early Belgians.

The Shire and Clydesdale.—The Shire is the largest and heaviest of all breeds of draft horses. The breed originated in England and has remained the leading type of draft horse in that country. During the period 1850–1900, a number of Shire

stallions and mares were imported to the United States, but the breed did not meet with much favor in this country and has decreased in numbers during recent years to the point where there are few purebred Shires left in the country. The extremely large size of the Shire, together with a heavy growth of long hair on the legs and a tendency to develop thick, coarse skin on the legs, does not appeal to the American farmer.

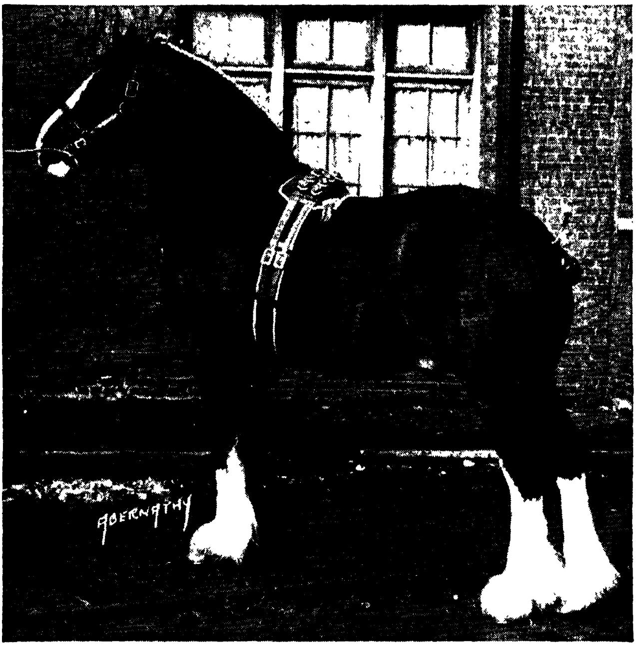

FIG. 84.—The Clydesdale stallion, Strathmore Guard. Grand Champion Clydesdale stallion, International Livestock Exposition, 1940. (*Photograph by Abernathy.*)

The Clydesdale originated in Scotland. This breed has the same color markings as the Shire, generally bay or brown, with some white on the legs below the knees and hocks and a white stripe or blaze extending the full length of the face. Grays and blacks appeared occasionally, but generally with the white on at least one of the legs and the white stripe in the face. More Clydesdales than Shires were imported to the United States during the heavy draft-horse-importing years. A number of importing firms developed, and a number of breeding farms

succeeded them. For a time the Clydesdale breed enjoyed considerable popular favor. Clydesdale geldings were in demand, especially for drawing heavy wagons in cities, where, because of their striking color and brisk walk, they possessed an advertising as well as a direct utility value. Although the breed never possessed the large size of the Shire, Clydesdales have always had the undesirable "feather," or long hair on the legs, which did not appeal to the American farmer.

FIG. 85.—The Suffolk stallion, Boxted Confider. Grand Champion Suffolk stallion, International Livestock Exposition, 1940. (*Photograph by Abernathy.*)

Overemphasis on action, failure to maintain sufficient width and depth of body to ensure easy keeping, and the undesirable long hair on the legs led to a rapid decline in interest in this breed soon after the market for geldings in the cities disappeared. There are comparatively few breeders of Clydesdales and very little interest in the breed in the United States at the present time.

The Suffolk.—A product of Suffolk County, in northeast England, the Suffolk horse, has been recognized as a pure breed for about 150 years. It has been the leading type of farm-work

horse in its native county and in some other parts of England. Foundation animals have been exported to a number of other countries. A few Suffolks have been imported to the United States, but the breed does not have wide distribution in this country. A registry association, the American Suffolk Horse Association, was organized in 1911. The office of the secretary is in Chicago, Ill.

The distinguishing characteristics of the Suffolk are its uniform reddish sorrel color, its characteristic size, somewhat less than that of horses of other draft breeds, its compact form, round, clean legs, mild disposition, and steady, moderate action. Since few mares of the breed have been imported to the United States and there is little incentive for importing at the present time, it is not likely that this breed will acquire numerical importance in this country.

THE BREEDS OF LIGHT HORSES

The breeds of light horses of importance in the United States at present are the Thoroughbred, the American Saddle Horse, the American Trotter, the Arabian, and the Shetland pony. Representatives of a number of breeds of carriage horses and harness ponies, such as the Hackney, the French Coach, the German Coach, the Cleveland Bay, and the Welch and Hackney ponies, were brought to the United States during the "horse-and-buggy" days. None of them ever attracted much interest beyond their use for pleasure driving and exhibiting at horse shows, and all have practically disappeared as pure breeds.

The Thoroughbred.—Originating in England, the Thoroughbred horse is one of the oldest and most widely distributed of all pure breeds. The breed was produced by crossing Arabian stallions on light mares that had been developed in England as a strain of horses noted for their ability to run fast. The Thoroughbred was recognized as a breed about the year 1800. Throughout the years this breed has maintained the ability to produce horses that could win running races against all comers. As a result, Thoroughbreds for use as breeding stock have been in demand in all countries where horse racing is a major sport. Many have sold at prices running into thousands of dollars. Thoroughbred stallions were used in improving both the American Saddle Horse and the American Trotter.

Registry of Thoroughbreds.—Registry of Thoroughbreds is maintained by the Jockey Club. The office of the secretary is in New York City.

Thoroughbred Type.—The Thoroughbred horse possesses a distinct type easily recognized, even by a novice, once he has closely observed a few typical representatives of the breed. The head is of medium size, broad across the forehead, with prominent eyes and moderately short, pointed ears. The neck appears

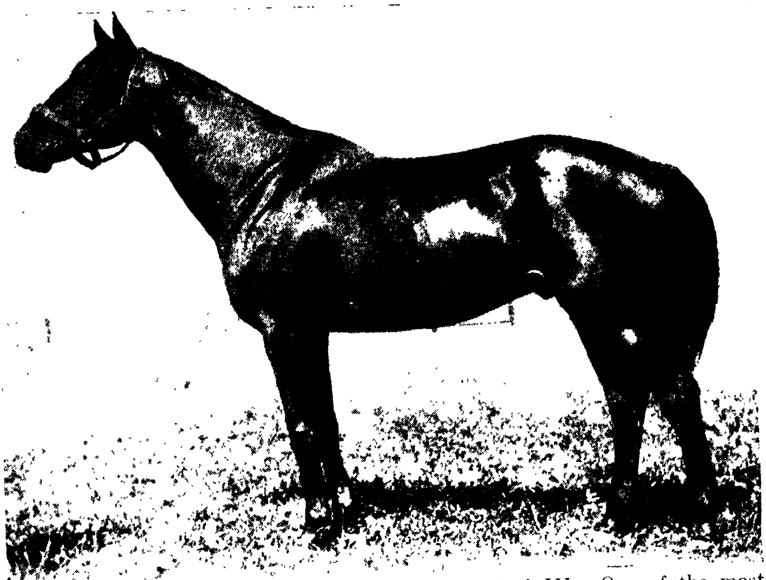

Fig. 86.—The Thoroughbred stallion, Sir Gallahad III. One of the most noted sires of the breed. (*Courtesy of Horse and Mule Association of America. Photograph by Sutcliffe.*)

long and lean. The body appears deep, medium in width, and muscular. The legs appear flat and strong, the pasterns long and sloping. The feet are of medium size. There is about the entire make-up of the Thoroughbred horse an appearance of quality, stamina, and durability, as though he had been chiseled by a sculptor. Along with this appearance of durability goes a covering of lean, powerful muscling, indicating strength. Typical Thoroughbred horses stand 15.2 to 16.2 hands in height and weigh 1,000 to 1,100 lb. All colors are found in the breed, though bay is the most common.

The American Saddle Horse.—Second only to the Thoroughbred in importance among the light-horse breeds of the present time in America is the American Saddle Horse. Developed first as a utility horse in the Southern states during the period 1800–1850, the American Saddle Horse was later bred for beauty and comfort to the rider and is now valued almost entirely as a pleasure riding horse. Beginning with the common light-horse stock of unrecorded origin in the Southern states, the Arabian, Thoroughbred, and American Trotting horse all contributed to the building of this breed. Perfecting of the type as a pleasure riding horse dates back only about seventy-five years. Marked improvement has been made since 1900.

The continued use and production of the American Saddle Horse are due to the healthful exercise and pleasure of horseback riding. Saddle horses are maintained in or near large cities by many families of wealth, even though they may be used only occasionally for a short ride. Bridle paths are maintained in many city parks, and many people consider a horseback ride over such a bridle path one of the most enjoyable methods of spending leisure time. Since the people interested in saddle horses for pleasure riding are often people of wealth, good saddle horses frequently sell at high prices.

American Saddle Horses are classed into two groups, designated as "five-gaited" and "three-gaited" horses. The three-gaited are those that possess the three natural gaits, the walk, the trot, and the canter. The five-gaited must possess two additional gaits, designated as the "slow gait" and the "rack." Seldom is either of the extra gaits natural to the horse. Both are produced by training. To develop them requires a great deal of patient work by a skilled trainer. This training represents a considerable part of the cost of producing a finished five-gaited horse. Many American Saddle Horses descended from five-gaited parents are unable to develop the two extra gaits satisfactorily and remain three-gaited horses. The slow gait is produced by urging a horse to travel a little faster than the walk and restraining him from traveling at a true trot. Under training, some horses learn to handle their feet and legs after a manner called a "running walk," some after a manner called a "fox trot," and some after a manner called a "slow pace." Any one of the three gaits is accepted as a satisfactory slow gait in saddle-horse

exhibitions. The object in training a horse to show a slow gait is to develop a gait faster than the walk yet easy on both horse and rider.

Horses are taught to rack by much the same method as in teaching them the slow gait, except that the rack is a faster gait and is acquired by urging the horse into a fast trot and then restraining him from breaking into a canter or run, also compelling him to move forward under restraint. When handled in this way, many saddle horses learn to move their feet and legs in a fast, even one, two, three, four succession that produces a rather fast gait that is showy and attractive to watch and easy on the rider. Some horses can rack about as fast as they can trot. The balance of stride and grace of carriage of head and body at the rack in large measure determine the price at which a "gaited" saddle horse will sell.

Registry Association.—The American Saddle Horse Breeders Association maintains the registration of American Saddle Horses. The office of the secretary is at Louisville, Ky.

American Saddle Horse Type.—Although the Thoroughbred and Saddle Horse are both used under the saddle, the approved types are quite different in body form. The Thoroughbred needs only to run fast and possess sufficient stamina to stand the strain of hard racing. The Saddle Horse is not required to possess speed at the run. In fact, he is seldom forced into a run, and when he is, it is at a slow run or canter rather than at a fast run. The Saddle Horse must possess above all else a neat, small head, a long neck possessing sufficient fullness and arch to show symmetry and style, and a fullness of muscling throughout his body that produces a symmetrical, gracefully curved form. The Saddle Horse must stand high and moderately sharp at the withers and show an oblique slope of shoulder and pastern. He must be clean-cut about the head, throat, and legs and stand straight and strong on legs, pasterns, and feet. One of the problems in breeding Saddle Horses has been to maintain sufficient substance and durability or wearing quality in legs and feet.

The desired height is 15 to 16 hands and the desired weight, 1,000 to 1,200 lb. All colors are permissible, though chestnut and bay predominate and are the preferred colors. White on one or more legs from hoof to halfway between fetlock and knee

or hock is common and is not objected to, because it adds flashiness to the appearance of the horse in action.

The American Trotter.—Of all breeds of horses in the United States, the breed to experience most damaging competition from the automobile was the American Trotter. Suited primarily to use in light harness to draw carriages, buggies, and light

FIG. 87.—The American Saddle Horse Stallion, Dare of Shellcrest. (*Photograph by Smith.*)

delivery wagons on the country roads and city streets, the American Trotter was unable to compete with the speed and convenience of the automobile and truck. During the days of extensive use of light horses, there developed an interest in harness racing that is also diminishing rapidly at present. There is practically no use for American Trotters in this country at present except the remaining limited use in harness racing. Although there remain a few large breeding establishments

engaged principally in the production of race horses, the future for this breed does not appear promising.

Registry Association.—American Trotting horses are registered by the American Trotting Register Association. The office of the secretary is at Goshen, N.Y.

Type of the American Trotter.—The American Trotter had its origin as a breed in the Eastern and Southern states during the period 1775–1850. Developed from light mares of unrecorded origin, common to the Eastern states, both Thoroughbred and Arabian stallions were used in the improvement of the breed. At no time in its history could a single, well-defined type be described as the standard for this breed. There were some breeders who selected for a rather full-made attractive-appearing horse, of quiet disposition, especially suited for use as the family driving horse. Others selected for a horse of more active disposition, stylish appearance, and high-stepping action, suited to pleasure driving. Still others selected primarily for speed at the trot or pace, aiming to produce horses suited to racing. In breeding for speed, performance of ancestry on the race track has been emphasized rather than conformance to a specified appearance or body type. As a result of these objectives, there has always been considerable variation in form and appearance among purebred trotting horses.

Many horses of the American Trotting breed are trained to travel at the pace rather than at the trot. The pacing gait differs from the trot in that the front and rear legs on the same side are moved forward together. In the trot the diagonal feet and legs are moved forward simultaneously. Hobbles are commonly used in training horses to pace. The hobble compels the horse to pace rather than trot. In races many horses wear the pacing hobbles. A few trotting-bred horses are natural pacers. The pace has proved a trifle faster gait than the trot.

Those representatives of the breed developed for speed at the trot or pace rather uniformly appear neat in head and neck, moderately long in neck and body, sloping in shoulder and pastern, medium in width of body, deep, especially from withers to floor of chest, long in underline, medium in thickness of muscling, and rather upstanding. Legs are slender, and feet do not appear large, but both must show quality or the appearance of durability. Height may range from 14.2 to 16.2 hands

FIG. 88.—The start of a trotting race. Note uniformity in type of horses, also the simultaneous movement of diagonal legs in the trotting gait. (*Courtesy of U.S. Trotting Association.*)

FIG 89.—A pacing race. Note uniformity in type of horses also the simultaneous movement of two lateral legs in the pacing gait. (*Courtesy of U.S. Trotting Association.*)

and weight from 850 to 1,200 lb. A height ranging from 15 to 15.2 hands and weights of 1,000 and 1,100 lb. are preferred. All colors are permissible; bays, chestnuts, and browns predominate.

The Arabian.—Probably a direct descendant of the early Libyan horse of Africa, the Arabian horse has existed as a strain or breed in Arabia for many centuries. The breed has long been noted for its beauty of form, the nearly perfect setting of

Fig. 90.—The Arabian stallion Kahar. (*Courtesy of Alfred R. Watt, Barrington, Ill.*)

legs, pasterns, and feet, its strength in proportion to its size, and its suitability to use under the saddle for commercial purposes and pleasure riding. The Arabian horse was one of the first breeds of livestock to be sought out and imported to other countries for use in the improvement of native horse stocks. Although used to some extent in many countries for improvement purposes, the breeding of pure Arabians has not developed extensively in any country. The reason probably is to be found in the small size of purebred Arabians. Seldom do stallions

exceed 1,000 lb. in weight or mares 900 lb. A few Arabian horses were imported to the United States before the year 1800. As already stated, some were used in the formation of both the American Saddle Horse and the American Trotting Horse breeds. Interest in the breeding of purebred Arabians has been on the increase since 1900. Several importations have been made. Arabian horses are bred largely in a few large breeding establishments. Many are sold at remunerative prices for use as pleasure or business saddle horses. At present, ambition on the part of many people to own a purebred Arabian as a saddle horse is creating a strong demand for them.

Registry Association.—Arabian horses are registered by the Arabian Horse Club of America. The office of the secretary is at Barrington, Ill.

Arabian Type.—Present-day Arabian type calls for a small, neat head, neck of medium length, a rather full-made body appearing wider and deeper in proportion to size than the Thoroughbred or American Saddle Horse, medium length of leg with perfect setting of knees, hocks, and pasterns. The legs appear heavy-boned yet clean-cut and flintlike in quality. The feet appear large, perfectly formed, and tough. The whole make-up of the Arabian horse impresses one as indicating easy feeding capacity, strength, durability, stamina, and great power in proportion to size and weight. Height ranges from 14 to 15 hands, weight from 800 to 1,000 lb. All colors are permitted, with bays, chestnuts, and grays most common.

The Shetland Pony.—This smallest of all breeds or horse types was first known in the Shetland Islands north of Scotland. The suitability to riding and driving by children of Shetland ponies led to their exportation to many countries for this purpose. Many Shetlands were imported to the United States during the period 1850–1900. Many were sold in ones and twos for direct use as children's pets. Others were used to establish breeding studs. They continued to increase in numbers until they were widely distributed throughout the United States. A classification was provided for them at all major light-horse shows, and many breeding establishments undertook the improvement of the Shetland from the standpoint of producing a pony of more attractive appearance, more active disposition, and greater flash of action. An odd Shetland pony or two may still be found

on many farms and on the summer estates of many wealthy people where opportunity for children to ride and drive them without danger from traffic hazards may be had. A few breeding establishments continue to breed them in considerable numbers, and they are still seen in horse shows. Although the Shetland will continue to be a favorite with children, lack of opportunity to use it without traffic risk will probably limit production and sale in the future.

Registry of Shetlands.—The American Shetland Pony Club, organized in 1888, maintains a registry for purebred Shetland ponies. The office of the secretary is at Lafayette, Ind.

Shetland Type.—There has been considerable variation in the shape, size, color, temperament, and action of Shetland ponies. Breeders have, however, set up a definite standard as the type for the breed. To be considered a typical Shetland, a pony must stand 9 to 11.2 hands and weigh around 500 lb. He must resemble a draft horse in body form and proportions but must be able to carry his head high and show style, springiness, and speed in action. A clean-cut, well-formed set of legs and feet is essential in the show pony, but concessions are readily made by purchasers of ponies for use by children in both body form and quality of legs and feet, provided that a mild quiet disposition can be guaranteed. All colors are found in the breed. Many are spotted bay and white or sorrel and white. The solid colors black, chestnut, sorrel, or gray are preferred.

Some New Strains of Horses.—During the last ten to fifteen years, several new strains of horses have received publicity through the forming of registry associations by groups of breeders and through exhibition classifications provided for them by some livestock exhibitions. In this list the American Quarter Horse, the Tennessee Walking Horse, the Palomino, the Appaloosa, the Albino, and the American Spotted Horse are represented by organized breeders' groups. Registration is established or is in process of being established for each strain.

The American Quarter Horse.—Hall[1] states that the Quarter Horse was first recognized as a type in Virginia and was developed from an importation of 17 horses and mares brought from England in 1611 and 20 mares imported to Virginia in 1620.

[1] Hall, J. G., The Quarter Horse and Quarter Racing, *The Cattleman*, September, 1941, p. 17.

Later descendants of these horses were crossed with small Indian ponies, probably descended from the early importations by Columbus. Later Thoroughbred stallions were extensively used in improving the size and merit of the early type. Hall states that the Quarter Horse received its name because of its ability to run fast for a short distance. A registry for Quarter Horses published by Edgar in 1833 contained the names of 170

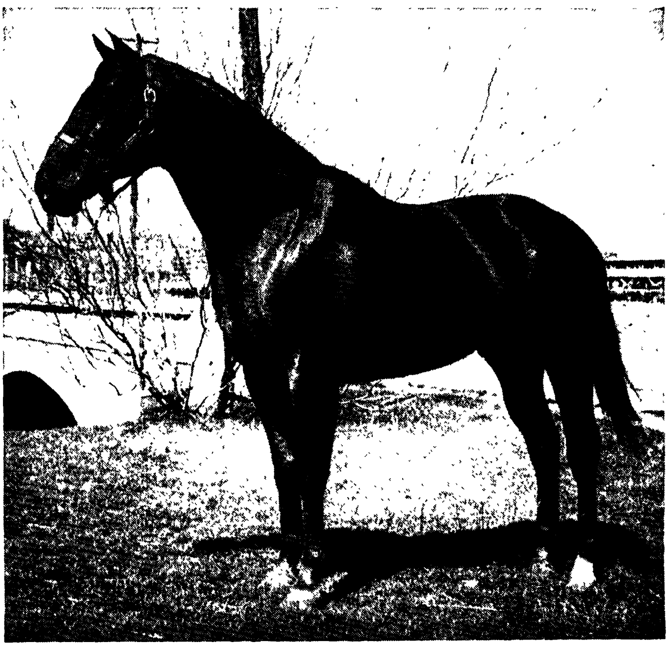

FIG. 91.—The American Quarter Horse stallion Peppy. Winner of many performance contests. (*Courtesy of The Cattleman, Fort Worth, Tex.*)

stallions and mares. Some of them were accepted as foundation animals in the American Thoroughbred stud book.

Following publication of the first list by Edgar, registration of Quarter Horses was discontinued until recently the American Quarter Horse Association, Fort Worth, Tex., issued its first official stud book. Throughout the history of the Southern and Southwestern states the Quarter Horse type persisted, even though registration was not maintained. Selection by men who had a clear conception of the valuable characteristics of the early Quarter Horse is responsible for retaining the type prized

for its utility value. The starting of registration by the American Quarter Horse Association promises to convert the strain into a breed and thus further promote its production.

The modern Quarter Horse is valued most by cattle ranchers for use as a cow horse. His stamina makes him suitable for "riding the range," his cool-headed temperament adapts him to "roping" work, and his speed for a short distance adapts him to "cutting" work. Cutting means riding into a herd of cattle

FIG. 92.—The Tennessee Walking Horse gelding, Strolling Jim. (*Courtesy of The Cattleman, Fort Worth, Tex.*)

and driving out a single animal. A great deal of this must be done in the operation of any large cattle ranch.

In form the Quarter Horse should be compact, short of back, closely coupled, deep-middled, and heavily muscled throughout. The jaw appears heavy, the eye mild, the ear small and pointed, the neck short. The muscling is thick throughout, appearing particularly heavy in the forearm, quarter, and gaskin. The desired height is 14.2 to 15.2 hands, the desired weight 1,000 to 1,300 lb. Colors vary, any color being accepted for registry except Albino or spotting.

The Tennessee Walking Horse.—This strain originated in Tennessee and was developed largely from American Trotting

Horse foundation stock. Walking horses are selected for greater depth of body, heavier muscling, and heavier bone than America Saddle Horses. Their distinguishing characteristic is a fast walking gait, very attractive to observe and easy on the rider. The Tennessee Walking Horse Breeders' Association of America was organized in 1935. The office of the secretary is at Lewisburg, Tenn. During the first six years of its existence, 5,000

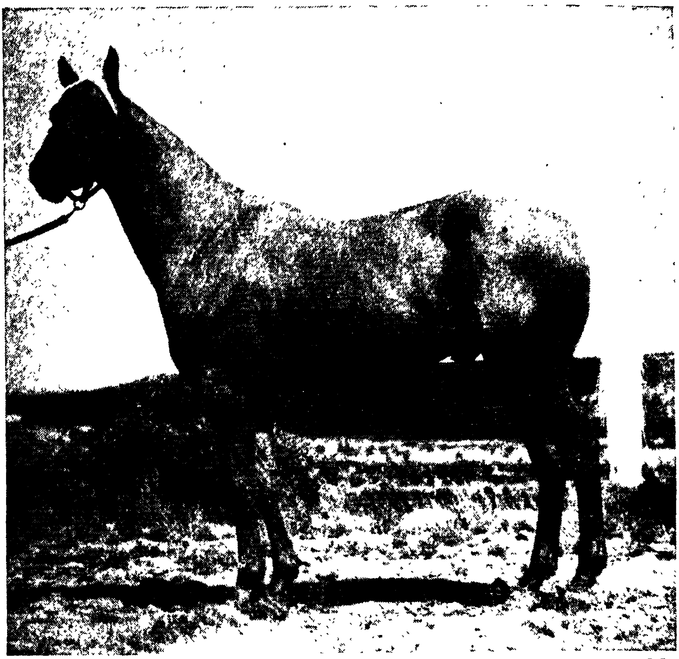

FIG. 93.—The Palomino stallion, Sobre Las Olas, Grand Champion Mineral Wells, Tex., Palomino Show, 1940. (*Courtesy of The Cattleman, Forth Worth, Tex.*)

pedigrees were issued. The Walking Horse has been widely publicized, and horses have been sold to buyers in many states. They are in demand principally for pleasure riding, though it is claimed that they make ideal farm-work animals.

The Palomino.—At present the name "Palomino," as applied to horses indicates that the horse belongs in a group classed together largely on the basis of color. The typical color is gold, with white or silvery mane and tail. The skin is dark. Many horses of this group are of the pleasure riding saddle type,

some resembling the American Saddle Horse to the extent of showing the five gaits. Many are also produced and maintained for saddle use on ranches. An association of breeders, the Palomino Horse Breeders of America, has been formed to carry on registration and promote the development of a standard type. As yet pedigrees are not being issued. The office of the secretary is at Ojai, Calif.

The Appaloosa.—Originating in Oregon, this strain takes its name from the Palouse River, along which many horses of the characteristic color markings are found. Horses of this strain must possess the distinguishing characteristic of a white croup, flecked with small spots of the prevailing body color, which may be any commonly found horse color. The Appaloosa Horse Club of Moro, Ore., maintains registration, though only a few pedigrees have been issued to date.

The Albino.—As indicated by the name, the distinguishing characteristic of the Albino horse is its clear white color. The skin is a pinkish or flesh color. A group of breeders organized as the American Albino Horse Club, with the office of the secretary at Butte, Neb. maintains registration for this new group. In form and size the Albino resembles the saddle horse and is used principally as a pleasure riding horse.

The American Spotted Horse.—The Morroco Spotted Horse Cooperative Association of America, with the office of the secretary at Menlo, Iowa, maintains a registry for horses of spotted color. As yet a type has not been established, the spotted color being the essential requirement for registration.

HORSE-BREEDING METHODS

Importance of the Pure Breeds.—The most constructive improvement in horses through breeding has been accomplished by the forming of pure breeds and their further improvement by a comparatively few outstanding breeders who maintain a considerable number of mares. The number of purebred herds and the number of purebred horses produced in any breed have, however, been much smaller than the number of purebred herds and animals in other classes of livestock. Through the standing or traveling of most purebred stallions for public service, the improvement secured in the pure breeds has been made available

and utilized in the improvement of common horse stocks more extensively than is the case with other farm animals.

Influence of the Show Ring.—Purebred draft horses have always been extensively exhibited at horse shows, and the show ring has had much to do with setting the type standards. Prize-winning stallions and mares and their progeny have always stood in high favor with breeders and farmers and have been purchased and used as breeding stock in preference to horses without exhibition records. Adherence to this plan in the purchase of breeding stock has brought about extensive increase in numbers of the progeny of outstanding animals and thus established comparatively few strains or families, usually descended from an outstanding stallion to which most of the purebred horses of the present day may be traced.

The Practice of Inbreeding.—In many instances, breeders possessing such an outstanding sire intensified his inheritance in their herds by inbreeding his descendants. A number of the most valuable and prepotent sires in each of the breeds of draft horses resulted from such inbreeding.

Importance of Type in Future Breeding.—Since the principal use now remaining for the horse is the drawing of farm implements and the same type of horse is suited to this work on all farms, farmer breeders can well pay more attention to type in horse breeding in the future than they have in the past. The most useful type of farm horse has always been the 1,500- to 1,800-lb. horse of draft type. Continued use of sires of the draft breeds, with a little less emphasis on size, on the present mare stock of the country will produce that type of horse.

Stallion Service.—The farmer who wishes to continue to raise colts for replacement of his worn-out work stock may need to give more attention to the problem of securing the service of a suitable stallion than he has in the past. The stallioner of former days who made a business of maintaining one or more stallions for public service has almost disappeared. If a suitable stallion is to be available in his community, the farmer must cooperate with some of his neighbors in the ownership and maintenance of a stallion, or he must own one himself and use him as a work horse as well as a sire.

Crossing of Types and Breeds.—Except as the crossing of types entered into the formative period in the production of the

draft breeds, there has been no crossing of types or breeds that has had a constructive effect during recent years. Crossing of types and breeds has, however, been extensively practiced throughout the history of horse breeding for the production of utility horses. Much of this crossing of types was done to produce a horse better suited to some certain type of work than could be secured from any available pure breed or standard type. For instance, on farms heavy horses were wanted for field work, and one or two light horses were needed for light driving duty. Besides these two types, a pair of horses with more weight than the light driving team and yet with ability to travel at the trot were needed for hauling produce to town, and such a team was very useful for certain other farm tasks. A horse suitable for this purpose could be produced by mating a trotting-bred stallion to a mare of draft type. Such a horse is also useful for many types of delivery service in cities.

Another reason why crossing of types or breeds has been practiced is that often a mare owner would have a mare of a type or breed for which a stallion of the same breed was not available in the community. This situation often resulted in the mare owner's breeding the mare to the most conveniently available stallion, even though it involved a mating of widely differing types. This practice of crossing types partly by choice and partly of necessity resulted in the production of a number of horses of nondescript type and mediocre merit. They form a part of the common horse stock of the country at the present time.

Breeding Light Horses.—The selection of American Saddle Horse breeding stock has for many years been based on observation and adherence to a specified, well-defined type. Since the pleasure riding horse is more extensively exhibited at shows than any other type of animal, selection has followed winners at the shows, and the show ring has more than any other factor influenced the selection of breeding stock. Little inbreeding has been practiced and no outside blood added since registration began.

For many years, in the breeding of both Thoroughbreds and American Trotting Horses, greater emphasis has been placed on the track records of ancestry and of the individual in question than upon body form or type. The aim has been to mate the

fastest mares to the fastest stallions in an effort to produce colts that will develop more speed than either parent. It was soon found, however, that there were limitations to the success met in this mating plan and that in the successful breeding of race horses enough attention must be given to form, constitution, and feet and legs to ensure stamina, strength, and durability in the horse. A considerable amount of inbreeding has been practiced in the production of race horses in the hope that speed would be transmitted more effectively when related animals were mated. Results from inbreeding have been only partially successful.

Selection of Arabian breeding stock has been based on observation plus the practice of a considerable amount of inbreeding. It is probable that the Arabian horse of today is more highly inbred than any other breed of livestock. It is also probable that the long-continued practice of inbreeding plus rigid selection carried on through many generations is responsible for the fixed characteristics and uniform excellence of Arabian horses.

The several new breeds of light horses are in the formative period. For most of them an ideal type has been described, based on some distinguishing breed characteristic, such as color, plus a form suited to some specific use principally under the saddle. For some years breeding will need to be directed toward perfecting the type and developing uniform inheritance of the desired breed characteristics. This will be accomplished largely by selection based on observation.

Questions

1. Trace the early development of the horse.

2. How has horse breeding during the last 200 years differed from the breeding of other farm livestock?

3. Name the five important breeds of draft horses, representatives of which have been imported to the United States.

4. Describe the present-day type of the Percheron breed.

5. Describe the present-day type of the Belgian breed.

6. Why did Shires, Clydesdales, and Suffolk horses fail to meet with a high degree of favor among American farmers?

7. Explain the origin, improvement, and uses of the Thoroughbred horse.

8. Explain the origin, improvement, and uses of the American Saddle Horse.

9. Explain the origin, improvement, and uses of the American Trotter.

10. What has been the principal contribution of the Arabian breed to the horse industry?

11. What are the characteristics desired in Shetland ponies?

12. By what specific breeding methods has improvement in work-horse stock been made?

13. How is the extensive practice of crossing of types and breeds in horse production explained?

14. State several of the important practices that have been followed in light-horse breeding.

15. Name the several new groups or strains of horses, and state the distinguishing characteristics of each.

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CHAPTER XXXIII

FEEDING HORSES

The digestive system of the horse differs from the digestive system of cattle and sheep in that the stomach has but one compartment and that rather small, compared to the four compartments of the stomach of ruminating animals. In this respect the horse resembles the pig rather than the ruminant. Differing from the pig, the horse has a large intestine or colon that is extremely big; considerable digestion and absorption take place in the colon, whereas digestive action and absorption have practically ceased by the time the contents of the digestive system reach the colon or large intestine in the pig and in ruminants.

The peculiar construction of the digestive system of the horse adapts him to the utilization of a bulky ration similar to rations suitable to cattle or sheep rather than to the concentrate ration required by the pig. Growing colts and idle horses may be maintained on pasture as their only feed but do not get along quite so well on pasture alone as do cattle and sheep. The horse at work may utilize some pasture but needs a liberal supplementary ration of grain and hay. In winter, young growing colts, brood mares, and horses at work require that a part of their ration be composed of grain; idle mature horses may winter satisfactorily on a ration of high-quality roughage.

Feeding the Work Horse.—The average life of the farm work horse is 15 years. This covers a growing period of 3 years, the time required to reach a working age, and 12 years of maintenance as a mature horse. During each year of the working life of the horse, there are seasonal periods of long days of heavy work, periods of lighter work, and periods of complete idleness. Successful management and feeding of the work horse require that his ration be changed, at least in amount of feed and proportion of grain to roughage, to meet the requirements of the kind and amount of work he is doing. Other factors to be considered are the size of the horse and the weather conditions under which he is working, especially the temperature. Besides these

factors, the form or type of the individual, his likes and dislikes as to taste of feeds, and his individual efficiency in feed utilization must all be given consideration in the feeding of horses at hard work if they are to be maintained in good health and without loss of weight. The average farm horse in a mixed-farming area works about 1,000 hr. per year. This amounts to 100 ten-hour days or 111 nine-hour days. This means that the horse is idle at least two-thirds of the year.

One of the advantages of the horse as a source of farm power is that for short periods of time, over short distance, he can exert a pull nine to ten times his normal capacity. Well-trained teams have exerted short-distance pulls up to just a little short of their own weight. It has been determined, however, that the average 1,500- to 1,600-lb. horse may draw a load requiring a steady pull on the traces of about 150 lb. through a 9- to 10-hr. period as a day's work. To perform such a day's work regularly, he must be fed to about the limit of his capacity to consume, digest, and assimilate feeds in variety best suited to his digestive system. This means that one-half or a little more than one-half of the ration by weight be composed of grain and one-half or a little less than one-half be composed of hay, all feeds being of good quality. Since the work horse is mature and no longer needs to develop additional growth or body tissue, his requirement above the feed for maintenance of his own vital activities is for energy to propel his body in walking and drawing the load. The nutrients needed are largely carbohydrates and fat, with a low requirement in protein and minerals compared to the type of ration required by the growing animal.

The simple ration of oats as the grain and timothy hay as the roughage has long been a standard ration for work horses. The most common modifications of this ration are (1) substitution of upland prairie hay or hay made by cutting oats or other grain before the grain is quite ripe for the timothy hay and (2) substitution of corn or barley for the oats. Which of these feeds should be used may be determined by their respective costs, since any combination of any of the grains mentioned with any of the roughages mentioned makes a satisfactory ration. The horse is a little less susceptible to digestive disturbances when oats is being fed as a large part or all of the grain than when corn or barley is fed as the grain. The maximum amount of

grain and hay that may be fed to a horse at steady work over a long period of time is $1\frac{1}{4}$ lb. of grain and $1\frac{1}{4}$ lb. of hay per 100 lb. live weight per day. Thus a 1,600-lb. horse may eat as much as 20 lb. of grain and 20 lb. of hay or a total of 40 lb. of feed per day regularly so long as he is being worked a 9- to 10-hr. day. If the horse is idle even for a single day, such as on holidays and Sundays, the amount of grain fed should be reduced at least one-third, the amount of hay remaining the same. This precaution will help to prevent cases of colic, impaction, and azoturia, all common troubles of horses, caused by heavy feeding without sufficient exercise.

Many other feeds may be utilized in feeding horses, such as wheat bran, middlings, molasses, beet pulp, and the protein supplements as concentrates and any of the legume hays, corn fodder, sorghum fodder, or silage as roughages. These feeds can be used to greater advantage in the feeding of brood mares, growing colts, and idle horses than in the feeding of horses at hard work. One practice formerly considered inadvisable in the feeding of work horses through the summer season is now practiced extensively, with satisfactory results. That is the turning of work horses to pasture through the night. This practice does have a laxative effect on the digestive system and causes the horse to sweat more freely in warm weather. On the other hand, turning to pasture at night gives the horse a chance to cool out more completely, gives him a more comfortable night's rest, saves a little on the hay requirement, and saves on the amount of straw for bedding as well as on the labor required in cleaning the barn and grooming the horse. A horse sleeping out on the grass comes in clean in the morning. Horses kept accustomed to grass by being turned out every night can be left on pasture on idle days with a further saving in dry-feed requirement and in the labor requirement for care, with less likelihood of digestive disturbances than is the case when horses not accustomed to grass are turned to pasture for a day or two.

Bluegrass is perferred as a horse pasture, but many farmers who turn horses onto pastures of alfalfa and grass or clover and grass mixtures as well as on to sweet-clover or Sudan-grass pastures find that they do about as well as on bluegrass.

The dry-feed requirement per year for the 1,500- to 1,600-lb. work horse will depend upon the number of days he can be

carried on pasture as an idle horse. An average allowance to keep a 1,500- to 1,600-lb. horse in good condition throughout the year would be 2,000 lb. of grain, 4,500 lb. of dry roughage, and 90 days on pasture.[1]

Oats and corn may be fed whole to horses, but barley should be ground. Rolling or grinding all grains coarsely is advised as a means of avoiding digestive disturbances and securing slightly more efficient utilization of feed.

Feeding the Brood Mare.—How the brood mare must be fed will depend on how much work she is doing besides raising a colt. The simple and ideal way of handling, managing, and feeding the brood mare while nursing a colt is to turn mare and colt to pasture and allow them to remain there, where both will do very well on good pasture as the only feed. This plan of raising a colt, on the other hand, removes the mare from the list of work horses during the season when the full list of work horses is needed. To raise colts by turning mare and colt to pasture requires the maintenance of the mare the full year as an extra horse without getting any service from her in work. This plan of raising colts puts too large an expense on the production of the colt to make it pay to raise him.

In raising colts profitably, it is necessary that the brood mare be used as a work horse. She must then be fed just as a work horse is fed, receiving the same kinds and the same amounts of grain. As soon as grass is available, mare and colt should be turned to pasture at night for the benefit of the colt as well as for the benefit of the mare. The colt should be left in a box stall at the barn during the day while the mare is at work, and then it needs to get out on pasture at night to get exercise and some grass. The grass will stimulate larger milk production by the mare but it will cause her to sweat unduly while at work, and if she is being worked regularly and hard, she may lose more weight during the nursing period than she would if maintained on dry feed entirely.

Brood mares may well be fed a little more grain while they are idle during the winter months than would be required by an

[1] ENGENE, S. A., *et al.*, Data Secured in 1939 on Farm Accounting Route, Winona County, Minnesota, *Mimeograph Report* 117, Division of Agricultural Economics, University of Minnesota, 1940.

ordinary work horse to make sure that they will be in top working condition at the beginning of the spring work season. They may also be fed a little heavier on grain on idle days and during slack periods through the summer than is necessary with the ordinary horse. Many horsemen like to use a grain ration containing 15 to 20 per cent bran or a high percentage of oats in feeding the brood mare rather than to use a ration of all barley or corn. The bran and oats are thought to stimulate milk production by the mare more than do highly carbonaceous grains such as corn and barley. The addition of 5 per cent by weight of a high protein concentrate, such as linseed meal, will further stimulate milk production.

Feeding the Foal.—The young foal has no use for feed other than his mother's milk until he is about four weeks old. At this age, he may begin nibbling a little hay and also a little grain. Young foals usually learn to eat grain and hay by poking their noses into the manger or feed box beside their mother while she is eating. As soon as the foal has shown an inclination to eat regularly, he should have a grain box of his own and be fed a grain ration just as regularly as his mother. He may be fed the same ration his mother is receiving, though a mixture of about 60 per cent oats and 40 per cent bran is an excellent grain ration for young foals during the nursing period. While nursing, there is little danger of a foal's overeating on grain, and he can be fed about all the grain he will clean up in three feeds per day. Since the mare should be receiving a good-quality hay, this same kind of hay will be acceptable for the foal. One light feed of a good-quality legume hay each day is highly desirable for both mare and foal, but the bulk of the hay ration might better be a nonlegume hay.

Feeding the Growing Colt.—Foals are often given the best of care and feed until they are weaned and then are neglected through their first winter, with the result that they grow very little between weaning time and the beginning of the grazing season the next spring. It is during the foal and yearling stage that the colt is building his bony framework more rapidly than at any other age. It is therefore essential that he not only be fed liberally during his first winter but that he also be fed the right kind of feeds. Feeds rich in minerals and protein are needed following weaning and during the first winter.

Foals are weaned when four and one-half to five and one-half months old. They should receive a liberal allowance of grain as well as some good hay, even though they may run on pasture for several weeks after weaning before the winter feeding period begins. The grain ration for the foal following weaning should be composed of some such mixture as 85 per cent oats and 15 per cent bran or 50 per cent corn, 35 per cent oats, and 15 per cent bran. This grain feeding should continue throughout the first winter, the colt receiving about 1 lb. of grain per day for each 100 lb. that he weighs. Along with this, he should receive all the high-quality roughage he cares to eat.

With the beginning of the grass season in the spring, when he is about one year old, the growing colt can best be turned to pasture and may subsist on pasture alone so long as good pasture is available. Through the second winter, the growing colt should again receive a grain ration, but it need not be quite so liberal as during the first winter. One-half to three-fourths pound of grain per 100 lb. live weight per day will be sufficient through this second winter, but the colt should again have all the good-quality roughage he cares to eat. The third summer should be another season on grass. As the growing colt comes to the beginning of his third winter at about two and one-half years old, he is ready to take his place with the work horses but should still receive a slightly more liberal grain allowance than the idle mature work horse will need during winter months.

The growing colt that has been fed about as outlined in the preceding paragraphs will attain practical maturity at three years old and is then ready to take his place in the list of work horses and may be fed and worked the same as mature work horses, except that he should be favored with a little lighter work when possible during his three-year-old season.

Feeding Light Horses.—Light horses are fed much the same feeds as work horses, but in smaller amounts. The smaller amounts suffice partly because of the smaller size of the horses and partly because of the different nature of their work. The average light horse drawing a light vehicle or carrying a rider need not exert himself so much as the average work horse drawing a load. Light horses generally work more irregularly and work shorter days than work horses. As a result, the light horse fares best when he is fed hard, sound grain and hay rather than

soft concentrates or coarse roughages. Oats has long been the stand-by of light-horse men as about the only concentrate for light horses. It may be partly replaced by corn or barley, and a little bran may be added in the feeding of growing colts and brood mares. Just as oats is the favorite grain for light horses, clean, bright timothy is the favored hay. The timothy may be replaced by a good-quality upland prairie hay or a good-quality grain hay. Legume hays are used very sparingly in the feeding of all light horses. They are considered bulky and too laxative in their effect on the digestive system. The fact that light horses require smaller amounts of feed per head per day than work horses is due almost entirely to the smaller size of light horses, and the requirement per 100 lb. live weight per day is about the same.

Questions

1. How does the digestive system of the horse differ from that of cattle and swine?

2. What is the average number of years of work secured from the farm work horse?

3. What is the average number of days of work per year?

4. What are some of the factors to be considered in selecting feeds for the work horse?

5. What constitutes a normal day's work for the average farm horse?

6. What feeds are most commonly used for horses?

7. What amounts of grain and roughage per day are required by horses at steady work?

8. What is the yearly requirement for concentrate feed, dry roughage, and days of pasture for the average work horse?

9. How should the feeding of the brood mare differ from the feeding of the average work horse?

10. State some of the essentials to the successful feeding of growing colts.

11. How do feed requirements and feeding methods for light horses differ from the requirements for work horses?

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CHAPTER XXXIV

THE MANAGEMENT AND CARE OF HORSES

Horse management involves several enterprises that may be considered separately as distinct phases of horse production and use. On many farms no attempt is made to raise colts. Horses required for work are purchased as needed. On such farms the problems of management and care are limited to providing comfortable stabling, proper feeding, maintenance of health, and the proper harnessing, hitching, and driving of the horses so that the highest possible efficiency for work may be secured from them. On farms where only one or two colts are raised for replacements each year, there is very little added responsibility in management and care. If a stallion is maintained and traveled for service, this presents a special enterprise that must be given special attention. If a stallion is maintained and used as a work horse, his management and care fit in with the management and care of the work horses and require very little extra attention. If purebred mares are used as work horses and as many colts as possible raised each year, there is added the problem of developing and selling surplus colts, particularly the stallions.

The breeding of light horses and their training are a highly specialized enterprise requiring highly skilled management and care. Management in light-horse production and management of exhibition stables, racing stables, or riding academies involve several distinctive procedures. The important management plans in horse production and use may be listed as (1) the maintenance of farm work horses, (2) breeding purebred draft horses, (3) maintenance of the draft stallion, (4) breeding light horses, (5) maintenance of the exhibition stable of light horses, (6) maintenance of the training stable, (7) maintenance of the racing stable, and (8) maintenance of the riding academy.

Maintenance of Farm Work Horses.—When the farm-management plan calls for the purchase of work horses as needed, rather than the raising of colts for replacements, one

of the most important horse-management responsibilities is the selection and purchase of suitable horses. They are not always easy to find and, when located, sometimes appear high in price. The most economical and satisfactory horsepower is secured by the purchase of sound, pleasant-dispositioned young horses of good draft form weighing from 1,500 to 1,800 lb.

Properly fitted collars and hames are the most important requirement in harness equipment. Many horses which are plump and full in the collar seat when the spring work begins shrink away as the work season advances. The fit of collars and hames should be inspected frequently and adjustments made as needed as the season advances. Such adjustments often require the use of sweat pads at about the time the hot weather begins.

Efficient use of horses requires hitching them in teams varying in number per team according to the requirement of the kind of work being done. Hitches have been devised providing for the successful and simple hitching and driving of any number of horses from 2 to 30 in one team. It should be the aim in such types of farm work as plowing, harrowing, disking, and seeding to use a liberal supply of horsepower in as large units as are adaptable to the size of the farm and fields. Large teams reduce the amount of man time required and save on the man-labor cost. Teams of 4 to 8 horses cover the range of most economical hitches on most farms.

Farm horses are, for the most part, worked without shoes. In order that the greatest possible wear of the feet may be had, it is essential that the feet be kept properly trimmed and level on the sole. If the horse is required to work steadily for long periods, even at farm work, the feet sometimes become so worn that it is necessary to put shoes on them for a time. It is always cheaper to have a horse shod before his feet become so worn that he goes lame than to wait until shoeing is necessitated by lameness. It may take some time for the sore-footed horse to recover even after being shod.

Breeding Purebred Draft Horses.—It is likely that there will be a demand for a considerable number of draft stallions and some purebred mares at least for some years to come. Maintaining a sufficient number of purebred mares of one of the draft breeds to do all the farm work and raising as many colts

as possible from them offer an opportunity to increase the income from the farm appreciably from the sale of the stallion colts and an occasional mare. This procedure requires some additional barn room for housing the growing colts, some additional labor in their care, and some additional feed. It requires closer attention to the feeding and care of the growing colts than is necessary in the raising of grade colts. The purebreds must be developed as sound, attractive-appearing horses, or they will not sell readily.

Buyers for the surplus stock must be found. This requires judicious advertising and good salesmanship. If several horses are to be sold each year, it is well that an exhibit be made at a county fair or two and the state fair. If as many as six to eight horses of high merit are produced to sell annually, it will pay to exhibit at one or two national exhibitions besides the state fair. A small amount of livestock-journal advertising will usually pay if several horses are to be sold annually. To be a successful salesman, exhibiting and advertising must be supported by enthusiastic effort on the part of the breeder to convince prospective purchasers of the worth of horses generally and of his sale offerings in particular.

Maintenance of the Draft Stallion.—Management and care of the draft stallion are simplified if the stallion is treated and used as a work horse. Owners of good draft stallions often believe that it is preferable not to work the stallion in order that he may be maintained in high flesh and attractive appearance. Many believe that it is more profitable to travel the stallion and that in that way more mares will be bred and the stallion may prove more profitable than if he is worked. Some stallions are of such active or nervous disposition that they do not make satisfactory work horses.

If the stallion is not worked, he should have a box stall with a door opening into an outside exercising yard so that he may be comfortable when confined in the barn and so that he may easily be turned outdoors regularly for exercise. Stallions are sometimes traveled in trucks but more often in trailers made especially for the purpose. Such trailers may be drawn by an automobile. If traveled by truck or trailer, it is important that the horse be given exercise each day during the breeding season. Such exercise should be a walk of 2 to 4 miles. It is the common

practice to allow a mature stallion to serve as many as three mares in 2 days. Since breeding of mares generally begins in April and continues through July, a good stallion, well cared for, may breed from 100 to 150 mares during a season. The stallion that is worked usually will not have so many mares brought to him but may breed 60 to 75 mares.

Breeding Light Horses.—The ownership by a farmer of from one to three or four mares of one of the light breeds, notably the American Saddle breed, and the mating of them to a public-service stallion are common practice in some of the Southern states. The breeding of light horses is, however, tending toward centering in a few large breeding establishments, many of them maintained by men of wealth. Some such establishments make a profit; others do not. Their management plans and problems vary so widely that a detailed discussion of them will not be attempted here. The purchase of foundation breeding stock is a highly important item in determining the success that will be met. Development and training of the colts produced are an important feature of the enterprise. Some breeding establishments train and exhibit or race the colts they produce. Others sell colts at early ages, leaving it to the purchaser to train them. Many of the colts are sold in auction sales.

Maintaining an Exhibition Stable.—So many exhibitions of pleasure riding horses are held with sufficiently large prizes that a profitable business may be made by the purchase and exhibiting of saddle horses at shows. Persons engaging in this enterprise sometimes buy promising young horses, train them, and sell at any time that a buyer who will pay a profitable price is found. Others keep the same horses for several years, or as long as they can show a profit from their winnings. Such professional exhibitors try to carry with them entries for as many different classes as possible, often carrying five-gaited horses, three-gaited horses, jumpers, and sometimes a few carriage horses, roadsters, and Shetland ponies. This business, which is one of the most highly specialized of all the light-horse enterprises, should be entered into only by persons thoroughly familiar with its requirements.

Maintaining a Training Stable.—A few persons have developed profitable training stables for light horses. There are stables where pleasure riding horses are trained, stables where thorough-

breds are trained to race, or stables where harness horses are trained to race. Many such training stables are maintained in rented barns at fair grounds or race courses where race tracks are available. Horses are taken in for periods of several months at a fixed fee for board and care and at a fee for training. Some such establishments are highly successful and render a much appreciated service to owners of one or two colts who cannot afford having them trained in any other way. There are a few large training establishments maintained by companies formed by a group of larger breeders and owners of racing stables.

Maintaining a Racing Stable.—An enterprise presenting a management plan all its own is the maintenance of the racing stable. This involves the ownership of a string of horses that are moved from one race meet to the next. It is the aim of the owner of such a string of horses to make a profit from prize money won in races, plus profitable dealing in horses. Owners of such racing stables often buy and sell horses frequently, so that the dealing phase of the enterprise is an important feature of it. Many breeding establishments maintain racing stables as a means of advertising their productions.

The Riding Academy.—Many persons living in cities who cannot afford to own a saddle horse like to ride horseback. Such persons like to rent a horse at so much per hour and ride occasionally. The demand for horses for this purpose creates an opportunity for a few men to make a business of maintaining a stable of horses near a large city or near a bridle path in a large city and renting them to persons who wish to ride. Lessons in riding are usually offered by such riding academies so that children or older people desiring to learn horsemanship and riding decorum may take lessons. Successful management of a riding academy requires especially ability to attract a large enough patronage to make the enterprise profitable. Operators of riding academies always offer facilities for boarding horses owned by patrons. Most operators also buy and sell as opportunity affords.

The Care of Horses.—The amount and kind of care required by horses depend on the kind of horse and the kind of work he is doing. The fact that all mature horses are used for the performance of work of some sort necessitates attention to each

individual animal. To facilitate the necessary handling and care, horses are treated singly rather than in groups. Each horse is stabled in a single-tie stall or box stall and fed individually according to his needs. When being fed heavily on concentrates, horses cannot be fed in groups, because some would overeat, and ensuing digestive disturbances would be disastrous. Determining the correct amount of feed for each animal and regulating the amount of feed given according to the condition of the horse and the work he is doing are important items in successful care. In stables where a large number are maintained, it is the common practice to have one man responsible for all the feeding and the care of the stable. He is given responsibility to see that collars and harnesses are kept properly fitted and in repair. He is also given authority over teamsters or drivers to see that they keep the horses assigned to them properly groomed and that they handle their horses quietly and kindly. Little difficulty is experienced in this respect, because any human being assigned to handle horses soon becomes attached to them and will not abuse them himself or allow anyone else to do so. Grooming of work horses is beneficial not only from the standpoint of keeping them clean and attractive in appearance but from the standpoint of keeping the skin pores open and the glands of the skin functioning. It is not so important that growing colts or idle horses be groomed.

Care of the feet, particularly with growing colts, is important and is too often neglected. The walls of the hoof of growing colts often grow faster than they are worn down. If allowed to go untrimmed, they may wear unevenly, causing the foot to assume an abnormal shape and the weight to rest on it unevenly. This, in turn, may interfere with the action and cause some unsoundness to develop. The feet of growing colts should be examined every three to four months and be carefully trimmed when needed. This is especially important in all types of light horses, where perfect development of feet and legs is essential to their usefulness.

Diseases and Parasites of Horses.—Since the usefulness and value of a horse depend in large measure upon how long he lives and upon his being in good, sound condition for work when needed, the maintenance of health is of utmost importance. There are many diseases and several damaging parasites to

which horses are subject. Fortunately, few of the diseases are highly contagious. The maintenance of health is a matter of watching each individual animal to see that injuries are avoided insofar as possible and given prompt care when they do occur. Development of unsoundnesses should be prevented insofar as possible, since there is usually no treatment or cure once they have developed. Some unsoundnesses are due to inherited weaknesses and can be eliminated only by selecting breeding stock known to be free from the tendency to develop them. Among the communicable diseases that are most troublesome are sleeping sickness, abortion, navel ill, distemper, influenza, pneumonia, glanders, dourine, swamp fever, and anthrax. Some noncommunicable derangements of normal functioning that frequently cause trouble are colic, azoturia, founder, and several respiratory troubles. Among internal parasites are many forms of worms found in the digestive tract. The principal external parasites are lice and mange.

Sleeping Sickness (Encephalitis or Encaphalomyelitis).—In several sections of the United States and Canada, notably the North Central states and western Canada, sleeping sickness has during recent years been the most dreaded and most damaging of all horse diseases. Its cause is known to be a virus. Its carrier host is thought to be flies or mosquitoes. The disease occurs almost entirely during the fly and mosquito season. It is a disease that affects the brain, causing inflammation that deranges the functioning of the nervous system, followed by partial paralysis. A dull, listless, semiconscious condition and uncertain gait are early symptoms that the trouble may be sleeping sickness. When suspected, a competent veterinarian should be called without delay. The death loss will be high if affected horses are allowed to go untreated. The death loss of affected animals can be reduced to 25 per cent or less if skillful, thorough treatment is administered. During the last four years, a vaccination treatment has been developed that is believed to be highly effective in preventing development of the disease. Vaccination is recommended in areas known to be heavily infected. Vaccination must be administered during the spring months.

Abortion.—Abortion or the expulsion of the fetus prematurely has been a troublesome disease in mares in the United States

during the last fifty years. Abortion is known to be a bacterial disease that is spread by entrance of the germ through the mouth or by the serving of a mare by an infected stallion. There are as yet no known cure for the disease and no successful means of prevention except sufficiently strict hygiene and sanitation to prevent its entrance or to eliminate the infection from a farm, once it has appeared. On farms where an abortion has occurred, a veterinarian should be consulted for instructions on procedure to follow in an effort to keep the disease under control and eliminate it from the farm. Occasionally a mare may abort because of malnutrition or an injury, but such noninfectious abortions are rare.

Navel Ill.—This is a disease of young foals that seems to be closely associated with abortion in mares. It is due to a streptococcus type of bacteria that may enter the body of the foal though the unhealed navel cord or by the mouth. Symptoms are a swelling or pus formation at the navel, followed in a day or two by swellings appearing in the joints. The joints may swell and show the infection without any abnormal condition showing at the navel. The disease is accompanied by a high fever. There is no known cure for it. Prevention by strict sanitation, including careful disinfection of the navel cords of all young foals each day until they are healed, often proves only partly successful. Death loss of affected foals runs about 90 per cent. During the last several years, sulfanilamide has been used with some success as a cure for the disease.

Distemper, Influenza, and Pneumonia.—These are contagious diseases affecting the respiratory systems of horses. Symptoms of all of them are running at the nose, difficult breathing, and high temperature. When one or more horses in a group appear to be suffering unduly from colds, a veterinarian should be called promptly for diagnosis and treatment.

Glanders, Dourine, Swamp Fever, and Anthrax.—These are communicable diseases of horses, each of which has proved troublesome in at least some sections of the United States during some time in the past. Although none of them is thought to have been completely eradicated from the country, no serious outbreak has occurred during recent years.

Colic.—Colic is a term applied to most forms of digestive disturbances in horses. Such digestive disturbances are often

accompanied by severe pain and discomfort. Colic is usually caused by overfeeding or the giving of spoiled or partly spoiled feeds. Treatment calls for the giving of a laxative to clear the digestive system of the material causing the trouble. Horses usually recover from all but the most severe cases of colic. Occasionally, because of some abnormal condition in the digestive tract, colic becomes a chronic condition, with frequent recurrences. Careful feeding sometimes cures such cases, though occasionally they are very stubborn, and the horse subject to them becomes practically useless or may succumb to an attack.

Azoturia.—Azoturia is the result of faulty metabolism. The first symptoms are nervousness, sweating, lameness, followed by inability to walk and the passing of brownish or reddish colored urine showing the abnormal metabolism. It often occurs following a rest period of a day or two in a horse previously at steady hard work. It can generally be avoided by reducing the concentrate part of the ration by one-third during the idle period or by turning a horse to pasture on idle days. Cases of azoturia, once developed, are difficult to treat, and the mortality is high. If a case of azoturia is suspected, a veterinarian should be called at once.

Founder (Laminitis).—Founder, or laminitis, as it is technically and more accurately called, is a condition in which the laminae tissues of the feet become congested with blood, inflamed, and sore. It results from a number of causes, notably when a horse unaccustomed to work is required to do a hard day's work, especially if the work is on a hard surface. Laminitis is more likely to occur during hot weather than during cold weather. It is sometimes caused by overfeeding, but overfeeding is by no means the only cause. A type of laminitis called "parturition laminitis" occasionally follows parturition in a mare. Regardless of the cause, the beginning symptoms are always the same, soreness of the feet, particularly the front feet. Treatment requires packing the feet in ice and rest for the horse. Many cases of founder become mildly chronic. The affected horse will appear sore on his feet when he is first taken out of the barn, and after he has walked a short distance, circulation of blood is stimulated, relieving pressure, and the horse may work the remainder of the day without showing soreness at all. Chronic

cases of laminitis are usually aggravated by time and finally render the horse useless.

Heaves, Broken Wind, Roaring.—These are all conditions of the respiratory system, causing difficult breathing and rendering a horse partially or entirely useless. There is no cure for them.

Internal Parasites.—A number of forms of worms are commonly found in the digestive system of the horse. As a rule, none of them is very troublesome. Occasionally young colts running in pastures throughout their first summer become so heavily infested with one or more of the intestinal worms that they become unthrifty and need to be treated with a good anthelmintic to eliminate them. If a colt appears unthrifty without some other known cause, it is well to suspect a worm infestation and call a veterinarian to prescribe treatment. The larva of the botfly is one of the most troublesome of all internal parasites of horses. It may be present in the digestive systems of older horses as well as in colts. When a group of horses, particularly horses that have spent a great deal of time in pastures during the summer, appear unthrifty from no known cause during the winter, a veterinarian should be called for diagnosis and treatment. Often bots will be the cause of the unthrifty condition.

Lice and Mange.—Several forms of lice and several forms of mange mites are rather frequently found on horses that are not groomed regularly, especially during the winter months. Their presence is evidenced by rubbing against the side of the stall or on fence posts. In severe infestations, the hair will come out over the most heavily infested areas. Washing or dipping with any standard stock dip solution will eliminate lice. A second treatment should always be given about 14 days following the first. The ordinary stock dips will destroy some forms of mange. Other forms of mange must be treated with a tobacco dip or with the lime sulphur dip prescribed for mange on cattle and sheep. It is advisable to wait for the first warm days of spring to wash or dip horses for the elimination of lice or mange.

Questions

1. Name the several management procedures encountered in horse production and use.

2. State the important items requiring managerial attention in the maintenance of farm work horses.

3. Outline a management plan for the breeding of purebred draft horses.
4. Outline the several plans by which horse breeders may secure stallion service.
5. How does the management of a light-horse breeding establishment differ from the production of work horses?
6. State the objectives and problems encountered in the maintenance of the exhibition stable of light horses.
7. State the objectives and problems encountered in the maintenance of the training stable.
8. State the objectives and problems encountered in the maintenance of the racing stable.
9. What services are usually offered by a riding academy?
10. Why are horses generally stalled and fed singly rather than in groups?
11. Why should work horses be groomed regularly?
12. Why is it necessary to trim the feet of growing colts?
13. Name the most damaging communicable diseases of horses.
14. Name the most troublesome noncommunicable ailments.
15. What parasites are troublesome in the care of horses?

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CHAPTER XXXV

JUDGING HORSES

Ability to judge the merits of a horse by observation is essential to successful buying or selling as well as to successful breeding. Work horses are valued more on the basis of their conformance to standards as judged by observation than is the case with any other kind of livestock. This is because the value of a horse depends on a complex list of requirements and characteristics, all of which influence his usefulness in one way or another. Horse judging is further complicated by the many uses to which horses are put, each with specific requirements as to size, form, action, and disposition. All horses may be divided into two groups, based on the type of service they render. The work horse or heavy group includes those used under heavy harness for draft purposes; the light-horse group includes those used under the saddle or in light harness. Since the light harness horse has been almost completely replaced by the automobile, the light-horse group now includes almost entirely horses used under the saddle.

There is about as much division of interest between horses of the two groups as one might expect between two entirely different kinds of livestock. Seldom is any person who is concerned with the production or use of work horses interested in the production or use of light horses. Since the great majority of all horses are of the work type and fewer people are interested in the light types, the procedure in judging as herewith explained will be limited largely to the judging of work horses.

Because the judging of horses is more complicated than the judging of other kinds of livestock, it is especially important that the beginning student study the score card and do practice scoring before turning to practice in comparative judging. From the study of the score card, the student should gain an idea of the important requirements of the work horse, a knowledge of the names of parts, and a vocabulary for use in criticizing

an individual. Figure 94 shows the location of the different parts as described on the score card.

PERFECT SCORE FOR DRAFT HORSE

Scale of Points	Perfect Score
I. **Age**—Estimated	
II. **Height**—Estimated	
III. **Weight.** 1 year, 1,000 lb.; 2 years, 1,400 lb.; 3 years, 1,600 lb.; 4 years, 1,700 lb.; 5 years, 1,800 lb..	4
IV. **Form**—52 points	
Head and neck—7 points	
Head. Medium size, straight face line, clean-cut features, wide angle in lower jaw; muzzle broad, nostrils large, lips thin, even; eyes prominent, large, full, bright, clear; forehead broad; ears medium size, set close, carried alertly	5
Neck. Medium long, muscular, medium crest, clean throat	2
Forequarters—19 points	
Shoulders. Sloping, muscular, well laid in	4
Arms. Short, muscular; forearms muscular, wide	2
Knees. Wide, deep, straight, clean, strongly supported	2
Cannons. Short, wide, flat, tendons well defined and set back	2
Fetlocks. Wide, straight, strong, clean	2
Pasterns. Long, sloping (45 deg.) strong, clean	3
Feet. Large, deep; heels wide, hoofs dense; smooth and free from cracks	4
Body—14 points	
Withers. Well defined, level with hips	1
Chest. Deep, wide, full, large heart girth	3
Ribs. Long, well sprung, close	3
Back. Short, broad, strong, muscular	3
Loin (or coupling). Wide, short, heavily muscled	3
Underline. Relatively long, flank low and full	1
Hindquarters—28 points	
Hips. Smooth, wide, level	2
Croup. Long, level, wide, heavily muscled	2
Tail. Attached high, well carried	1
Thighs. Muscular, deep, wide between the stifles	2
Quarters. Deep, heavily muscled	2
Gaskins. Wide, heavily muscled	2

	Hocks. Large, wide, deep, straight, clean, caps turned in slightly	8
	Cannons. Short, wide, flat tendons well defined and set back	2
	Fetlocks. Wide, straight, strong, clean	2
	Pasterns. Fairly long, sloping (50 deg.) strong, clean	2
	Feet. Large, deep, heels wide, hoofs dense, smooth, free from cracks	3
V.	**Substance.** Large bones and joints	4
VI.	**Quality.** Bones and joints clean; tendons well defined; skin and hair fine; head and ears medium size	3
VII.	**Temperament.** Energetic, good disposition	2
VIII.	**Action**—10 points	
	Walk: Long, straight, snappy, springy, well-balanced stride	6
	Trot: Long, straight, snappy, springy, moderately high, well-balanced stride with good flection of knees and hocks	4
IX.	**General appearance.** Massive, broad, deep and short-coupled body, rather low set; size and quality well proportioned to weight; symmetrical and stylish	9
	Total	100

NOTE: The score card was prepared by staff members of the Division of Animal Husbandry, University of Minnesota, for use in the teaching of judging.

Since horse judging is complicated, practice in comparative judging under expert guidance is of great help to the beginning student in building up complete and correct images of the different types. The student must expect to practice much comparative judging before he can hope to qualify as a competent judge.

Procedure in Studying Form.—Because there are so many points to be inspected critically in examining the form of a horse, it is well for the judge to develop a systematic method of looking over each animal. Most judges prefer to begin by standing a few feet away, directly in front of the animal. From this position observation is made of such points as length and width of head, length and carriage of ears, prominence of eyes, strength of muzzle, width of chest, and size and position of front feet. From a position taken by stepping around to the side and remaining from 10 to 20 ft. away, the body form should be studied. From this position, one takes note of length and depth of body,

length of neck, slope of shoulder, strength of back and loin, slope of croup, and general appearance as to style and symmetry. From the same position, length of leg, shape, strength, and quality of knee and hock, length, slope, and strength of pasterns, and, again, size of feet should be studied. Passing around to the rear, one first notes width of body, then muscling of the quarters, condition of hocks, as viewed from the rear, and width of heel of both fore- and hind feet. When conducted by an

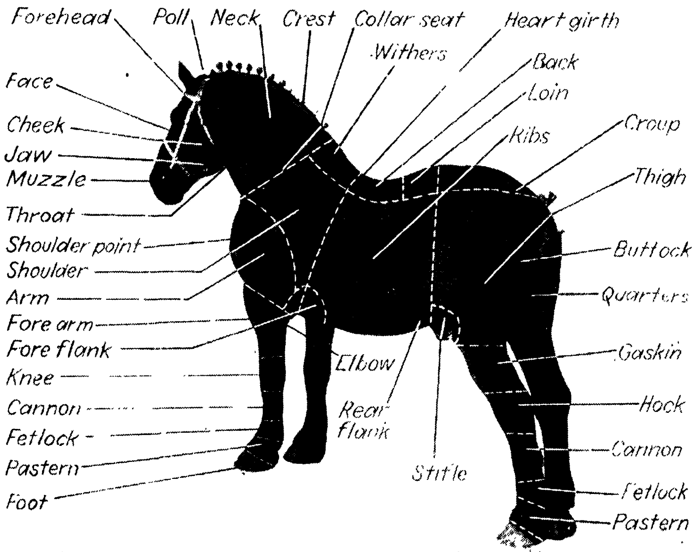

FIG. 94.—Showing location of parts of the draft horse.

experienced judge, this entire inspection should take not more than two minutes' time, following which the judge should be able to turn away from the horse and give a thorough criticism of his strong points and his weaknesses in form, substance, quality, and general appearance.

Action.—The way the work horse handles himself at the walk affects his usefulness and value. The horse that walks with a straight, long, energetic, businesslike stride is more pleasant to work, will cover more distance, and his legs will wear longer than one that walks with a short, choppy, stilted stride. Action is studied by having the horse walked directly away from the

judge a distance of from 60 to 75 ft., then returned directly to the judge. He is then moved in the same way at the trot—not that work horses are expected to do their work at the trot, but the way a horse handles himself at the trot reveals strength or weakness in action more noticeably than does the walk.

Judging Light Horses.—Although the procedure in judging and valuing light horses is much the same as that followed in valuing draft horses, the light types differ widely in form and

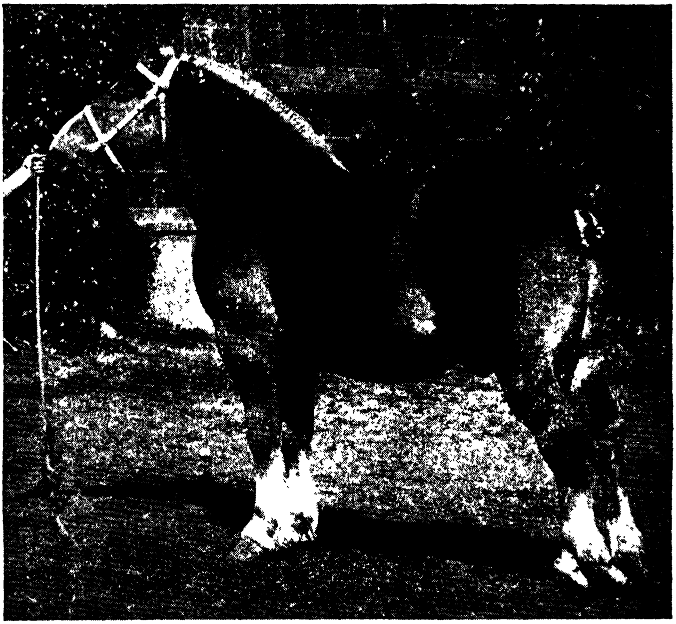

Fig. 95.—The Belgian stallion, Loewenstein. Grand champion Belgian stallion International Livestock Exposition, 1937. A well-proportioned, heavy-muscled, stylish horse of heavy-draft type.

action from the work horse. Greater emphasis is placed on such qualities as symmetry, style, and action. The saddle horse is often valued according to his beauty and his performance under the saddle more highly than upon characteristics indicating all that is to be desired in form and durability. The race horse is more often valued according to his demonstrated speed or track record than according to his form.

At exhibitions saddle horses are judged under the saddle. Riders are required to put them through their several gaits.

Light harness and carriage horses are shown hitched to appropriate vehicles and driven to show their action. The showing of light horses at large livestock exhibitions is usually conducted as an evening performance for which an extra admission is charged. There is usually sufficient public interest in such light-horse exhibits to attract capacity audiences in the amphitheaters or judging arenas in which they are held.

Determining Age.—One of the important factors determining the value of any horse is his age. The skilled horseman is able to determine the age of horses up to about eight years old by the appearance of the incisor teeth. The young foal has the first pair of incisor teeth, both upper and lower, when about a week old, the second pair at four to six weeks, and the third pair at six to nine months. These are temporary or foal teeth. They are much smaller, shorter, and the enamel is whiter in color than the permanent teeth that appear later. The first or center pair of incisor teeth on both upper and lower jaw begin to be pushed out by the incoming permanent teeth when the colt is about two and one-half years old. The center pair of permanent teeth are full-grown and in wear at about three years old. The second or intermediate temporary incisors are shed at three and one-half to four years, and the permanent intermediates are in place and in wear at about four years old. The third pair or corner pair of temporary incisors disappear at four and one-half to five years, and the permanents are in place and in wear at about five years old.

When they first appear, the permanent teeth have deep cuplike depressions in the biting surface. These depressions are completely worn away in the center pair below when the horse is six years old, from the intermediate pair at seven years, and from the corner pair at eight years. The cups disappear somewhat later from the upper teeth. Some horsemen believe the disappearance of the cups from the upper teeth can be counted upon to indicate the correct age for three more years. Observation of a good many mouths of horses of known age leads to the conclusion that the cups in the upper teeth are worn away nearly as soon as in the lower jaw and that it is not possible to determine age accurately beyond eight years. As horses advance in age, the incisor teeth tend to become longer, narrower at the crown, and to meet at a more oblique angle. The experienced horseman

can guess to within a few years of the correct age of horses above eight years old by the general condition and appearance of the incisor teeth but cannot be certain to within so narrow a range as one year.

Height.—The height of a horse is measured in units called "hands." A hand is a distance of 4 in. Height is measured from the top of the shoe, or surface on which the horse is standing if he is not shod, to the top of the withers. The withers generally mark the tallest measurement that is shown any place along the top line of the animal. An occasional horse will measure a trifle higher over the hips than at the withers, but the height measurement is always taken at the withers. The height of most horses of draft type ranging from 1,500 to 2,000 lb. in weight will fall somewhere between 15 and 17 hands. Height is of importance principally as it is correlated with form and weight. Given the approximate height and weight of a horse of draft breeding, the experienced judge can describe with considerable accuracy, his appearance in type and form without seeing him. A horse of desirable draft form weighing 1,500 to 1,800 lb. in good flesh should stand 15.2 to 16.2 hands high.[1]

Weight.—Weight in the work horse is the most important factor determining the number of pounds of pull he can exert on the traces in starting a load. This has been demonstrated many times by test pulls on the horse and mule dynamometer, an instrument that is used in testing the pulling power of horses. Most horses that are trained to pull and that are willing to exert their utmost strength can exert a pull against the traces almost but not quite equal to their weight. The average pull comprising a normal load that can be exerted steadily through a normal work day without overtaxing a work horse is about 150 lb.

Unsoundness.—The appearance, usefulness, and value of a horse may be marred by many forms of injury, malformation, disease, and by ossification of joints, commonly called "bony unsoundnesses." Scars or malformations that affect appearance only and do not interfere with usefulness are called "blemishes," and except when they appear on horses that are wanted for exhibition purposes, they reduce the value very little. Mal-

[1] The figure following the decimal point in stating the height of a horse means 1 in., not one-tenth. Thus 16.2 means 16 hands 2 in., not 16$\frac{2}{10}$ hands.

formations, injuries, or ossifications of joints that do or are likely to cause lameness or render the horse useless are called "unsoundnesses." They lower value and may even render the animal entirely useless and valueless. Among the most serious and frequent of such unsoundnesses are ossifications of the cartilages just above the hoof at the sides of the front feet. Such ossifications are called "sidebones." An ossification often occurs between the joints of the pastern on either front or rear pasterns. Such ossifications are called "ringbones." Another such ossification that generally causes lameness occurs on the inside of the hock joint. Such an ossification is called a "bone spavin." Often the hock fills with fluid, causing a soft bulging at the front of the joint called a "bog spavin," or it may bulge at the sides, causing a swelling called a "thoroughpin." Hocks that are extremely crooked when viewed from the side often exert a severe strain on the tendon extending over the cap of the hock, causing inflammation, swelling, soreness, and reduced pulling power. When the tendon develops sufficient swelling to be plainly noticeable, it is called a "curb," or the horse is said to have "curby" hocks. There are other unsoundnesses that occur less frequently. A competent judge must be able to recognize all such unsoundnesses when he sees them. In making the detailed inspection of form he must be on the alert for any irregularity in any part that might cause him to suspect the presence of an unsoundness. If he does suspect an unsoundness at any point, that point should be inspected more closely to make certain of its condition. He may need to exert pressure on the part with the fingers to assure himself of the presence or absence of ossification. It is a general rule in all large exhibitions that a horse going lame or showing a clearly developed unsoundness may not win a prize.

Selecting Breeding Stock.—Although individual merit, as judged by observation, has been depended upon almost entirely in selecting horses for work, those men who have been leaders in breeding for improvement have placed considerable emphasis on ancestry and, when possible, on progeny. The show ring has been the principal test in locating and publicizing those individual stallions and mares of outstanding merit as individuals and as successful breeding animals. Show-ring winners themselves and progeny of show-ring winners have commanded greatest favor and highest prices as breeding animals.

Selection Based on Performance.—The horse and mule dynamometer, invented about twenty years ago, made possible measuring the pulling power of a horse in mathematical terms; however, this instrument has not been brought into use as an aid in selecting breeding stock. The reason is that the best stallions are usually not broken to harness, and mare owners do not believe that a pulling record would be of any great value as an aid in the selection or sale of progeny. No other type of performance record has been suggested or tried for work horses.

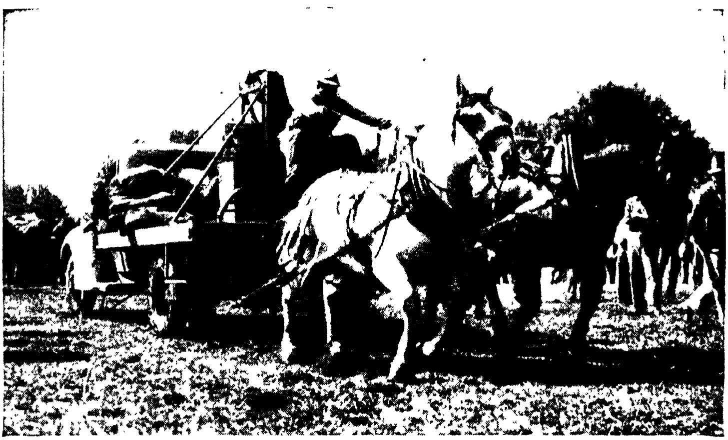

FIG. 96.—A team exerting a pull of 3,300 lb. on the horse and mule dynamometer. (*Courtesy of Horse and Mule Association of America. Photograph by Burd.*)

Track records have for many years served as a performance record for race horses, and many matings have been based entirely on the track records of the sire or on the records of both the sire and dam, the object being to mate the fastest mare to the fastest stallion in the hope of producing a colt that would inhert the ability to trot or to run fast from one or both parents. The record for having trotted a mile in the shortest time is held by Greyhound; time 1:55¼. The pacing record for the mile is held by Billy Direct; time, 1:55. The running record for the mile is held by Equipoise; time, 1:34⅖.

MARKETING HORSES

A special chapter dealing with market classes and grades of horses is not presented, because no generally recognized list of

horse classes that can be considered standard is being used by horse dealers. Market quotations seldom appear in print. When they are given, a wide variety of terms is used in different parts of the country, most of them having only local significance.

Horse-and-mule Markets.—A horse-and-mule market is maintained at nearly all large livestock markets. The horse-and-mule market is generally operated by a firm that will buy and sell on its own account or accept horses to be sold on commission. The commission charge for selling is usually $2 per head, plus a charge for stabling, feed, and care while the horse is at the market.

Many specialized horse-and-mule markets to which horses and mules may be consigned to be sold are maintained at strategic points distant from the central livestock markets. Such markets are owned by an individual or firm that will buy direct and resell or sell on commission, just as do the horse-and-mule commission firms at the large central markets. Selling by auction has long been a favored method of selling horses at all large markets. The usual custom is to hold an auction regularly on one or two days a week, at least during the heavy marketing season. At some markets weekly auctions are held the year around. In conducting the auctions, it is customary for the selling agency to put a list price or a "selling price" on each horse before he goes into the auction ring. The auctioneer follows this list, and if bidding does not reach the listed selling price or if no bid is received, the auctioneer announces no sale, and the horse is returned to the barn. Many sales are also made by private barter.

The Horse Buyer.—In the heyday of horse use the horse buyer was a familiar and important figure in the marketing of horses. The buyer usually maintained a sales stable in a moderate-sized town, then traveled to neighboring towns, spending a day in a town once a week or once every several weeks, advertising in advance by large posters or hand bills when he would be there to buy horses. He usually made the local livery stable his headquarters and the liveryman helped to advertise his coming. Farmers having horses to sell would then bring them to the livery stable on the appointed day to have them inspected and to get the best offer possible from the buyer. If satisfied with the offer, the farmer would sell; otherwise he was

free to take his horse back home. Often local livery-stable owners operated a sales business and would buy and sell locally. Often they would be commissioned to fill an order from a distant dealer in a large city. There is barely a remnant left of the large number of local horse dealers and traveling buyers of thirty years ago.

Direct Selling.—A majority of all horses that change ownership during a year are sold directly by the seller to the buyer without passing through the hands of any intermediate agency. This is because horse production is so widely distributed throughout the country that dealing is largely between neighbors, one of whom has a surplus horse or two to sell and the other of whom needs to buy one or two.

Questions

1. Why is ability to judge horses accurately of special importance in horse dealing or in horse breeding?

2. Name the two groups into which all horses are divided.

3. Name the important divisions of the scale of points on the draft-horse score card.

4. How would you proceed to make an inspection of a horse in evaluating him?

5. How does procedure in judging light horses differ from that in judging work horses?

6. Explain the determining of the age of a horse by the teeth.

7. How is the height of a horse measured?

8. How does weight affect the maximum pull that can be exerted by a horse?

9. What is a horse and mule dynamometer?

10. What is meant by an unsoundness in a horse?

11. Name the several important unsoundnesses that affect the bones.

12. What aids to observation are used in selecting breeding stock in horses?

13. What are the world's fastest pacing, trotting, and running records for the mile?

14. How are horses marketed?

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CHAPTER XXXVI

MULE PRODUCTION

General George Washington was the first American to suggest the advisability of producing mules in this country and the first person to secure jack stock from abroad.[1] It is recorded in history that when Washington's interest in mule production became known in the countries in which jack stock was then being produced, the King of Spain and the Marquis de Lafayette each presented General Washington with one jack and several jennets. This foundation stock arrived at General Washington's Mount Vernon farm in Virginia about 1788. Since the jacks were presented to Washington, they no doubt were the best obtainable in their native countries. Washington mated them to some good coach-type mares that he owned. Thus the first mules produced in the United States were exceptionally good mules. They proved admirably adapted to the farm work of the Southern states. As a result, a demand for jack stock with which to produce mules and a demand for mules to work spread rapidly throughout the South. Jack-stock and mule production soon grew to be one of the leading livestock enterprises of the Southern states and continues so at the present time.

The Uses and Adaptations of Mules.—The value of a mule is determined entirely by his ability to do work. Mules are used in harness and under the packsaddle. They have little value for pleasure riding or driving, they cannot run or trot fast, and they do not reproduce; yet as work animals they generally sell for 15 to 25 per cent more money than horses of similar merit. Mules are suited to many types of work. The larger ones are well adapted to the farm work of the Corn Belt and other draft duty. Medium-sized mules are especially prized in warm climates for sugar-cane and cotton production. Many rather small ones are used on Southern farms because sufficient larger

[1] ANDERSON, W. S., and J. J. HOOPER, American Jack Stock and Mule Production, *Ky. Agr. Expt. Sta. Bul.* 212, p. 242, 1917.

ones are not available. The smaller mules are also used in mines. Mules of all sizes are well adapted to various kinds of delivery-wagon work in cities. They are especially prized for certain types of army work, notably the drawing of munition and supply wagons. They are admirably adapted to driving in large team hitches. Some of the highly priced qualities and characteristics of the mule are his patient disposition, his ability to withstand heat and insects, his ability to take care of himself

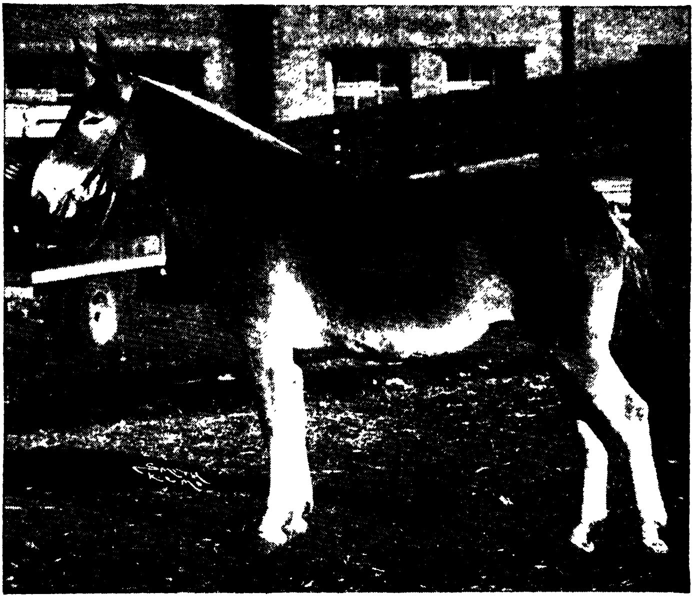

FIG. 97.—A "show" mule. Grand Champion mare mule, American Royal Livestock Exposition, 1939. A big draft mule showing substance with quality. (*Photograph by Smith.*)

in avoiding injury, his inclination to eat only what feed he needs, even though more is placed before him, his freedom from digestive disturbances and disease, and the tough, durable, long-wearing quality of his feet and legs. The frequent claim of two advantages of mules over horses—(1) that they require less feed than horses and (2) that for their size, they can pull more than horses—is erroneous. It is true that mules are generally smaller than horses, and for work where their size is sufficient, they may be more efficient simply because they do not have excess weight to carry. Many mules are inclined to walk faster than horses, and this adds to their efficiency.

Mules may be successfully produced in any climate or environment. In their native countries jack stock is produced in low, hot climates and in high-altitude cold climates. In the United States jack-stock and mule production and use have centered in the Southern states, because it is in warm climates that the ability of the mule to withstand heat is needed. Lack of size has been the handicap limiting the popularity and use of mules in the Corn Belt and other parts of the country, where ability to withstand heat is not so important and where the larger size of the horse is an advantage. The number of mules in the United States, according to the U.S. Department of Agriculture Market Statistics Report for January, 1941, was 4,238,000.

Producing Mules.—The production of mules requires (1) the breeding of jack stock for use as sires, (2) the breeding of mares, and (3) the crossing of the jack with the mare to produce the mule. The mule is a species hybrid resulting from the crossing of the ass with the horse. The hybrid or mule does not reproduce. The reason, explained genetically, is that the number of chromosomes in the germ cell of the horse differs from the number in the germ cell of the ass. The matured germ cells of the horse can unite with the matured germ cells of the ass to produce a live embryo. However, when this embryo becomes a mature animal, the uneven number of chromosomes makes impossible the maturation of live germ cells by either the male or female mule.

Breeding Jack Stock.—During the early history of mule breeding in the United States, the principal need was for jack stock. There were many mares to which the jacks could be mated. The ass had been produced extensively for many years in several countries about the western Mediterranean Sea. Many jacks were imported from these countries for use as sires of mules. Some jennets were also imported, and the breeding of jacks and jennets in the United States gradually developed so that now all the jacks required for mule production are bred in this country.

Through many years of breeding in small areas in their native countries, without the introduction of outside blood, a number of strains of asses, each having certain distinguishing characteristics, were developed. When imported to America they were accepted as pure breeds. The list of such breeds includes the Andalusian from southern Spain, the Majorca from the

Majorca islands in the Mediterranean Sea, the Catalonian from northern Spain, the Maltese from the island of Malta in the Mediterranean, the Italian from Italy, and the Poitou from western France. Of these, the Poitou, Catalonian, and Majorca produced the largest and best jacks and have been extensively used in the United States. When the breeding of jacks began to be taken up by a considerable number of people,

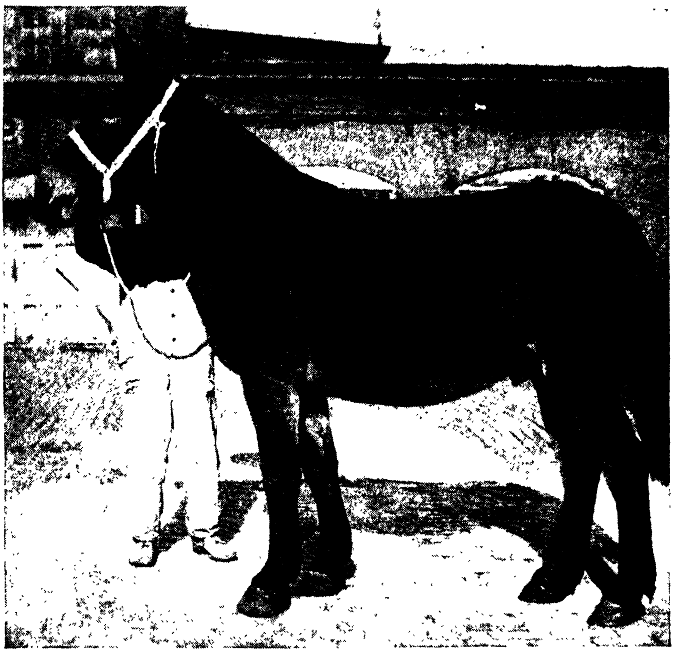

FIG. 98.—A typical draft mule. Height 16 hands, weight 1,600 lb. Especially suited to work on Corn Belt farms. (*Courtesy of Horse and Mule Association of America.*)

little attention was given to the source of breeding stock or the imported breed to which it belonged. Since pedigrees did not accompany the imported animals and pedigrees were not issued when sales were made in America, there soon came to be many American breeders who had in their herds a conglomeration of all the imported breeds. From this mixture there has developed a breeding stock known as the American Jack. In 1888 the American Breeders' Association of Jacks and Jennets was organized to begin the registration of breeding stock. In 1908

a competing registry association, the Standard Jack and Jennet Registry of America, was formed. Later the two amalgamated under the name, the Standard Jack and Jennet Registry of America. This association is the only one recording jacks and jennets at the present time. The office of the secretary is at Kansas City, Mo.

The principal aim of both associations formed for the registration of jacks and jennets was to direct selection toward a bigger

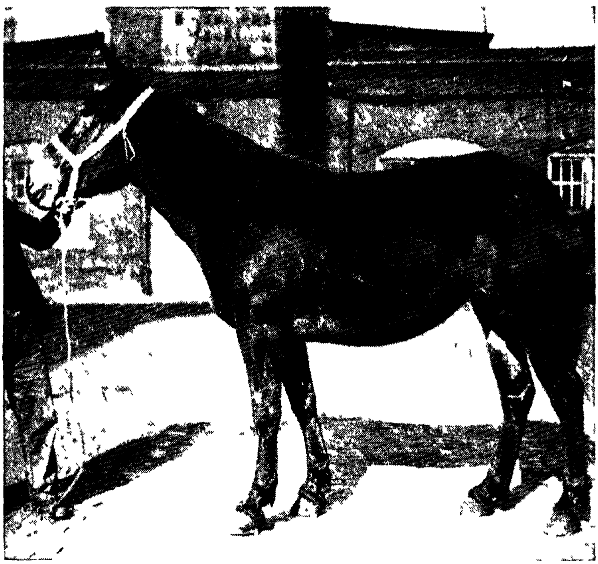

FIG 99.—A medium-sized farm mule (*Courtesy of Horse and Mule Association of America.*)

better, more uniform type of jack. From the beginning of jack-stock and mule breeding, there has been a continued persistent demand by buyers for greater size. The largest jacks and the largest mules have always sold for the most money. In the beginning, both registry associations accepted jacks and jennets from any source, provided they met certain measurement requirements. At present, any jack or jennet whose sire and dam are registered is admitted to registry. Animals from nonrecorded parents or with only one parent recorded are accepted for registry, provided they meet the designated measurement requirements.

There is still a great deal of variation in size, shape, quality, and color in the jack and jennet stock of the country. A type has, however, been agreed upon and a standard set toward which leading breeders are directing selection. To date, comparatively little inbreeding has been practiced, and little attention has been given to ancestry or progeny in the selection of breeding stock. Show-ring winnings have had considerable influence in directing selection.

Producing Mule Mares.—The term "mule mare" is commonly applied to mares used in producing mules. The kind of mare used should exert a 50 per cent influence on the kind of mule produced. In the Southern states many small mares of inferior body form and nondescript breeding are used as mule mares. The resulting mule foals seem to resemble the jack much more than they do the horse. This is probably because the inheritance carried by the jack is more firmly fixed through many years of selection for fixed characters than is the case with the mares. The experienced mule breeder prefers a mare carrying a mixture of draft-horse and light-horse blood, a mare of draft-type body form weighing 1,400 to 1,600 lb., with clean, sound, straight, heavy-boned legs and large, tough feet, a mare that moves freely, with snappy, straight action. To produce a good mule mare requires first the crossing of the light- and heavy-horse types. Few if any horsemen make a specialty of crossing the horse types for the express purpose of producing mule mares. Mule breeders seldom breed the mares they need but rather buy them wherever they can be found. Besides the mare carrying a cross of draft- and light-horse breeding, large, grade trotting or saddle-bred mares, and medium-sized grade draft mares make acceptable mule mares. Since there are many of these available, the mule breeder is generally able to secure fairly satisfactory mule mares, though he finds few that are ideal for the purpose. Successful mule breeding finally requires the mating of the most suitable jack available to the most suitable mares that can be secured. Since the mule colts will be valued only at work stock prices, conservatism in the amount of money invested in the breeding stock must be observed.

Feeding Mules.—The feeds suited to mules and jack stock are the same as those suited to horses. Amounts of feed required on the live-weight basis are likewise similar to amounts required

by horses. There is one marked difference in the method commonly followed in placing feeds before mules, as contrasted to the method that must be followed in placing feeds before horses. Mules and jack stock of any age, including mules that are receiving a full feed of grain at hard work, may be lot-fed in groups or self-fed from a self-feeder, whereas to attempt such a feeding method with horses would be disastrous. When doing steady hard work, the mule requires about 1 to 1¼ lb. of concentrate feed and 1 to 1¼ lb. of dry roughage per 100 lb.

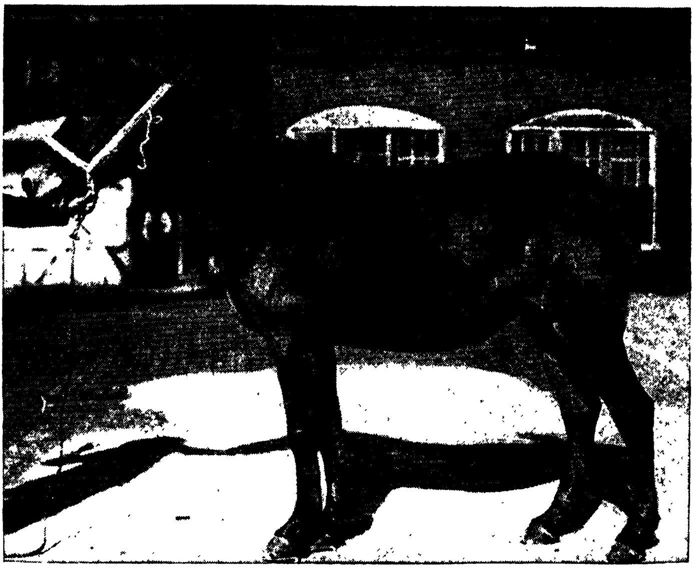

FIG. 100.—A medium-sized cotton or cane mule. (*Courtesy of Horse and Mule Association of America.*)

live weight per day. This is just about the amount he will eat, whether it is given to him individually in a tie stall or if it is given to him in groups from a large feed bunk or self-feeder. The self-feeder is preferred over the lot plan of feeding limited amounts in bunks by many mule feeders, because then timid or old mules are certain to have a chance to eat what concentrate feed they need.

Corn or oats alone or a mixture of the two may form all or the major part of the grain ration. Since mules are most extensively used in the Southern states, where molasses and cottonseed meal are available at low cost, these two feeds are often used to

supplement or replace part of the corn and oats ration. About 1 lb. of cottonseed meal per head per day is as much as the average mule will eat regularly. From 3 to 5 lb. of cane molasses per head per day is as much as it is desirable to feed to mules at hard work. When used, the molasses may replace corn or oats about pound for pound.

Johnson-grass hay, grain hay, and Korean lespedeza are the three kinds of hay most used in mule feeding in the Southern

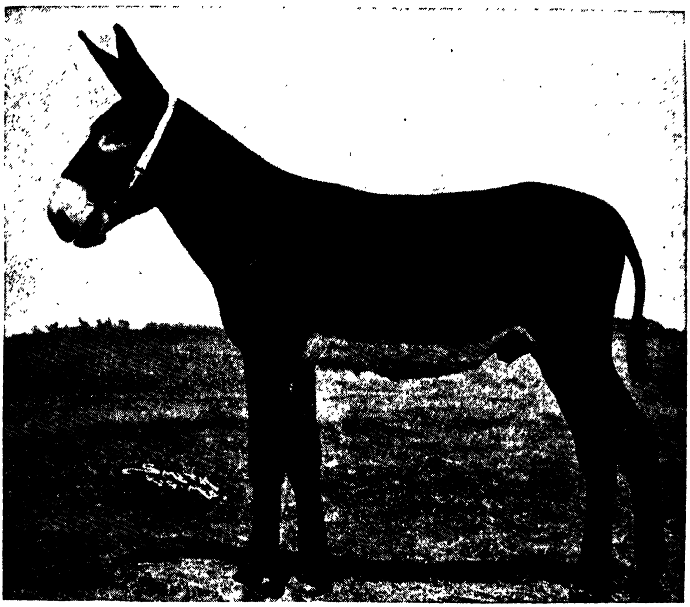

FIG. 101.—A typical "Mammoth" or American jack. (*Photograph by Smith.*)

states. An ideal roughage feeding plan is to have a nonlegume and a legume hay before the mules all the time and to allow them to eat what they care to of each. In Corn Belt feeding, corn as the grain and clover and timothy-mixed hay as the roughage make an ideal mule ration. Young growing mules and idle mature mules do very well on pasture and should be maintained on pasture to the greatest possible extent. In the Corn Belt mules are commonly stabled in tie stalls and are fed individually.

Mule Management.—Compared to the requirements of horse management, mule management is simplified by the fact that

mules may be housed and yarded together in small or large groups and may be fed as well in groups. The fact that they are so free from disease and injury further simplifies their care. On the other hand, the mule has a disposition all his own and must be handled kindly and carefully; otherwise he will become stubborn, unruly, and ready to "kick your hat off" at the slightest provocation. A mule will respond to kindness as will any other animal.

The management of a band of jennets in jack-stock production is simple from the standpoint of housing and care. Because of their small size, sluggish and stubborn dispositions, it does not pay to work them. They are run in bands or groups, just as a herd of cows would be. The percentage reproduction in jennets is low. About a 50 per cent foal crop is the best that can be expected. Since there is no income from the jennet that does not raise a foal, the cost of maintenance of breeding stock in jack production is high, even though the care and feeding of the individual jennet is small compared to the cost of maintaining a mare.

The management of a jack that is maintained as a sire presents several problems not encountered in stallion management. The jack is naturally an animal of sluggish disposition. He cannot be used to breed more than 60 to 75 mares per season. To breed readily, he must be maintained in one place under a regular routine of care, exercise, and feeding. He cannot be traveled from farm to farm as are stallions.

Jacks are subject to two troublesome diseases. One is called "orchitis" and the other "jack sores." Orchitis is an inflammation of the testicles and sperm cord. Severe cases render the jack useless as a sire. Orchitis can usually be prevented by keeping the digestive system in active condition through proper feeding, giving of laxatives, and keeping the circulation active by forced exercise. Jack sores are open sores that appear on the legs and are thought to be due to poor circulation of blood through the legs. Proper feeding, the occasional giving of laxatives and diuretics, clean sanitary quarters, and exercise are the best-known preventive measures.

Judging Mules and Jacks.—Were a score card to be presented for use in the scoring of mules, it would read so similar to the score card for the draft horse in every respect except weight and

appearance of the head and ears that it might as well be an exact duplicate. It is the shape of the head, the length of the ears, and the ratlike tail that distinguish the mule from the horse rather than a marked difference in form. There are differences in form, but the nearer a mule approaches the ideal in draft-horse form the better mule he is considered to be.

The following description of the ideal or standard for judging American Jack stock is presented through the courtesy of the Kentucky Agricultural Experiment Station.[1] Although this description was written twenty-five years ago, it is still accurate and applicable.

POINTS IN JUDGING JACKS AND JENNETS

1. Size.—Jacks and jennets must have plenty of scale. A jack should stand 15.2 to 15.3 and a jennet 15.1 to 15.2. If the jack is well proportioned and deep in body, 16 hands is a satisfactory height, but tall jacks that lack depth of barrel will sire leggy mules. A 16-hand jack should approximate 30 in. in depth of chest, 34 in. in length of foreleg and should weigh 1,000 to 1,150 lb.

2. Barrel.—The shape and size of the barrel are most important. Some jacks shrink perceptibly behind the shoulders and in front of the hips, and such should be relentlessly rejected. A good length of barrel is desirable. The hind flank should be as deep as the foreflank, each approaching 68 to 70 in. in circumference in a jack that is 15.3 hands tall. By all means the ribs should be well sprung. The best breeders abhor a flat, slim jack.

3. Bone.—The third essential is a big, clean bone. The small, deerlike cannons are not wanted and have no place in the breed of American jack stock. The front cannon should measure from 8.5 to 9 in., halfway down from knees to pastern at the smallest part. The bone should be fluted and clean. Even a 15-hand jack should measure 8.5 in. in bone. A 16-hand jack should have a 10-in. rear cannon, and a 15-hand jack should have one at least 9 in. in circumference.

4. Feet.—The feet should be large, round, and dense in texture. Jacks usually have durable, flinty feet, but often they are very

[1] *Ibid.*

much contracted and low at the heel. First-class jacks have large, deep feet with well-developed frog and bar.

5. Head and Ear.—It is customary to refer first to head and ears of jack stock. We have preferred to mention the preceding points first because they are more important, although we appreciate fully that an intelligent-looking animal with a fine pair of ears is preferable to any other kind.

The face line should be straight or slightly Roman. The ears must approximate 33 in. from tip to tip and be carried alert. The poll between the ears should be narrow, approximately 3 in. in width. Nothing condemns a jack more quickly than lop ears. The jack should have a strong jaw and heavily muscled neck. A ewe neck is not permissible.

6. Hindquarters.—Unfortunately, jacks are notoriously drooping at the rump, light in thighs, and ragged about the hips. The best jacks of today show great improvements in these respects. Also, many jacks are crooked in the hocks; but breeders are rejecting all males and females from their herd that have this defect.

7. Action.—Jacks and jennets should walk straight and true. The feet should clear the ground at each step. Some jacks show considerable speed and flection when trotting in their paddock. Good action is correlated with quality and proper conformation. A sluggish animal is greatly discriminated against.

8. Style and Quality.—A jack that holds his head and ears erect and walks proudly commands the respect and admiration of experienced breeders, because they know that such an animal is vigorous and properly formed and that his nervous system is well balanced. Quality is evidenced by fine, clean bone and silky hair. An animal of fine quality will usually show no evidence of jack sores or other derangements.

9. Color.—The preferred color for a jack is black with white points. The underside of the barrel should be white, and the white should extend between the forelegs and between the thighs. The muzzle should be white. In some animals, there is some white under the throat and around the eye. A brownish tinge will not prove a serious detriment, and a black barrel will not debar from the show ring, but a gray jack is at a serious disadvantage in the show ring.

MARKETING JACK STOCK AND MULES

There are comparatively few breeders of jack stock in the United States. The product of their breeding establishments has generally been sought out by prospective purchasers with comparatively little advertising effort on their part. Some breeders have exhibited rather extensively at fairs, and the show ring has been the leading advertising medium for the larger breeders. Occasionally auction sales have been held by breeders.

Mules are handled by nearly all horse-marketing agencies. Many specialized mule markets have been developed through the Southern states similar to the specialized horse markets in other parts of the country. At the mule markets, much selling is done by auction, just as at the horse markets. Many sales are also made by private barter between neighbors.

Questions

1. How did mule production become established in the United States?

2. What are the principal uses of mules?

3. Why are mule production and use centered so largely in the Southern states?

4. Why are mules unable to reproduce?

5. What are the important problems in breeding jack stock?

6. Name the three leading breeds of imported jack stock, and state the country from which each was secured.

7. How was the breed known as the American Jack produced?

8. How does the feeding of mules differ materially from the feeding of horses?

9. State how a jack that is maintained for public service should be fed and cared for?

10. In what points would a good work mule differ most in appearance from a good work horse?

11. Why are the head and ears given so much consideration in selecting jacks?

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